A McGRAW-HILL PUBLICATION

SEPTEMBER 1955

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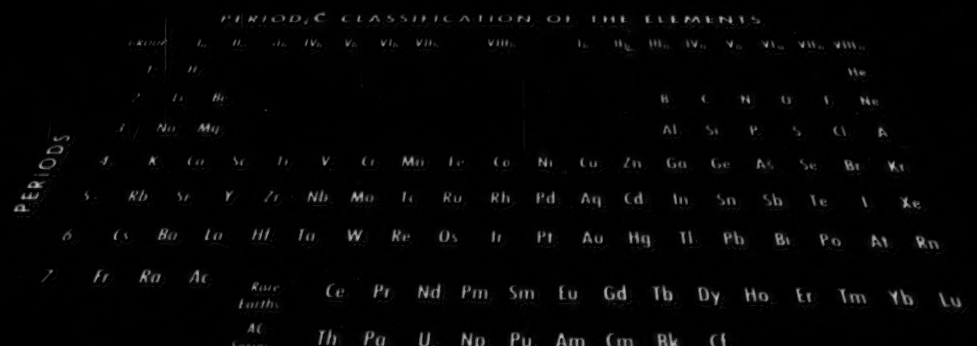
FOUNDED 1866

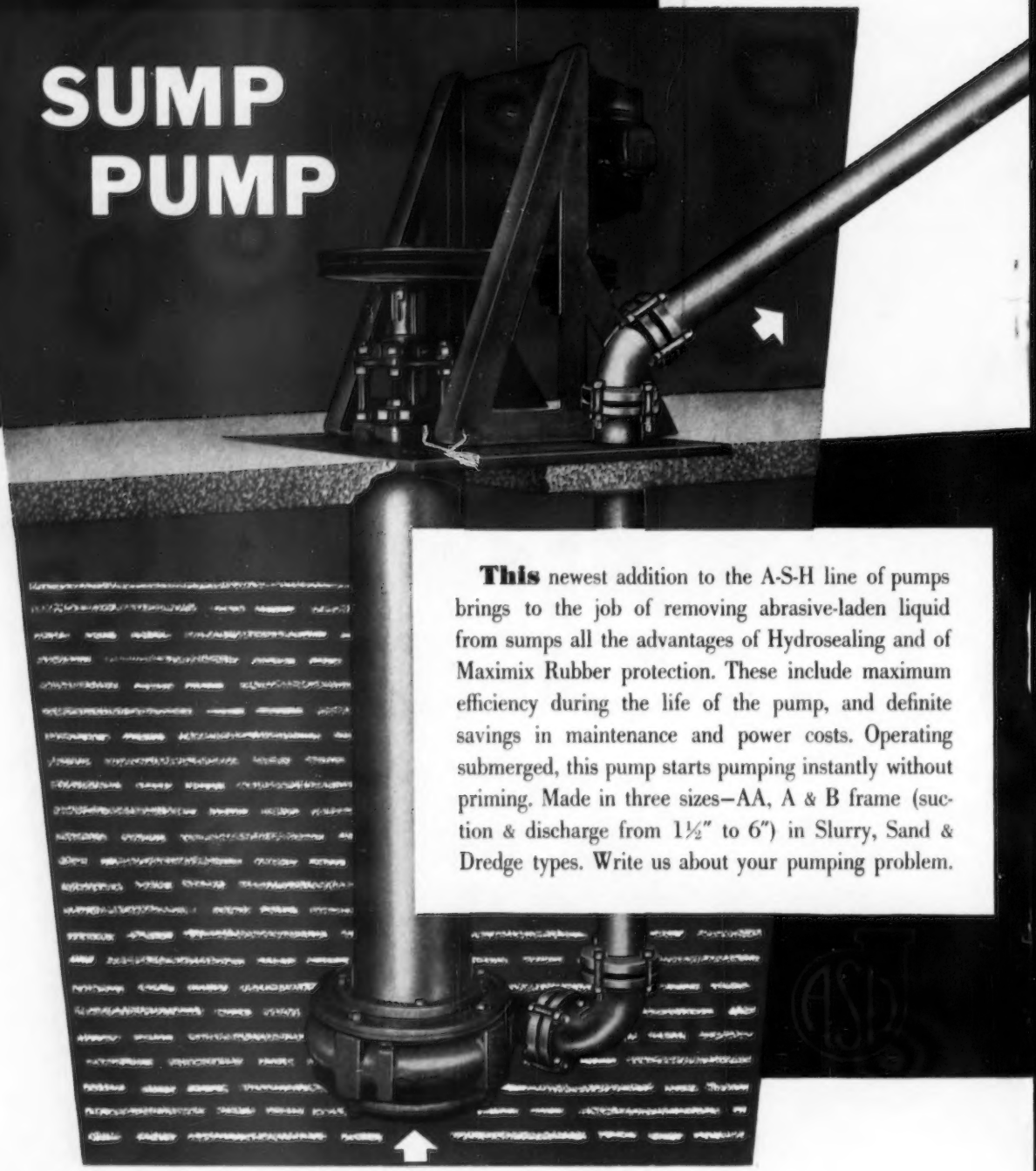
Lithium


PERIODIC CLASSIFICATION OF THE ELEMENTS
PERIODS
Rare Earths
AC Series
Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
Th Pa U Np Pu Am Cm Bk Cf

Full Report on Exciting Developments in Lithium Starts p 75

NEW Hydroseal

SUMP PUMP



This newest addition to the A-S-H line of pumps brings to the job of removing abrasive-laden liquid from sumps all the advantages of Hydrosealing and of Maximix Rubber protection. These include maximum efficiency during the life of the pump, and definite savings in maintenance and power costs. Operating submerged, this pump starts pumping instantly without priming. Made in three sizes—AA, A & B frame (suction & discharge from 1½" to 6") in Slurry, Sand & Dredge types. Write us about your pumping problem.

HYDROSEAL VERTICAL sump pump ... like HYDROSEAL and *CENTRISEAL* Slurry, Sand and Dredge Pumps

MAXIMIX RUBBER PROTECTED

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Representatives throughout the World

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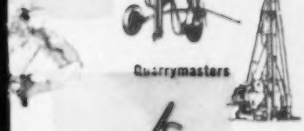
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Everything for Drilling Rock

FROM THE CARSET JACKBIT BACK TO THE COMPRESSOR

TO make the best recommendation for rock drilling equipment you must imagine yourself in the bottom of the drill hole. That's where the real results show up. From there you see only the Carset Jackbit.

But behind this Carset Jackbit there's a completely coordinated line of Ingersoll-Rand rock drilling equipment. Current models of Drifters, Stopers, Jackhamers, Wagon Drills, Jackdrills and Quarrymasters were all designed to take full advantage of longer-lasting, faster-drilling Carset Jackbits. Add rod and bit shop equipment, mountings, accessories and air compressors, and you have a complete I-R line backed by 80 years of experience, unequalled rock drilling know-how and undivided responsibility.

The Carset Jackbit with correct I-R supporting equipment is cutting rock-drilling costs, cutting operator fatigue and increasing production the world over. Whatever your drilling problems, consult your local I-R representative. He can help you solve them.

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ENGINEERING AND MINING JOURNAL

89th YEAR OF PUBLICATION

VOL. 156 No. 9

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Published monthly with an additional issue in mid-June by McGraw-Hill Publishing Co., Inc., James McGraw (1860-1948), founder.

Executive, Editorial, Advertising and Subscription Offices: McGraw-Hill Building, 330 West 42nd St., N.Y. 36, N.Y. Publication Office, 1309 Noble St., Philadelphia 23, Pa. Donald C. McGraw, president; Paul Montgomery, executive vice president; Joseph A. Gerardi, vice president and treasurer; John J. Cooke, secretary; Nelson Bond, executive vice president. Publications Division: Ralph R. Smith, vice president and editorial director; Joseph H. Allen, vice president and director of advertising; J. E. Blackburn, Jr., vice president and circulation director.

Subscriptions: Address correspondence to Engineering and Mining Journal—Subscription Service, 330 West 42nd St., N.Y. 36. Allow one month for change of address.

Subscriptions are solicited only from management, production and maintenance executives and engineers in the metal and nonmetallic mining and refining industry. Position and company connection must be indicated on subscription orders.

Branch Offices and District Managers: Atlanta 3, S. T. Henry; Chicago 11, F. W. Roets, G. A. Mack; Cleveland 15, J. E. Lange; Dallas 1, J. H. Cash; Los Angeles 17, W. C. Woolston; New York 36, H. C. Chelton, J. W. Patten; Pittsburgh 22, Wm. H. H. Ginder; Philadelphia 3, J. B. Lewis; St. Louis 8, F. W. Roets; San Francisco 4, J. W. Otterson; Washington 4, D. C. London address: McGraw-Hill Publishing Co., Ltd., McGraw-Hill House, 95 Farringdon St., London E.C. 4, England. Cable address: McGRAW-HILL, London. News Bureaus: Atlanta 3; Cleveland 15; Detroit 26; Houston 25; San Francisco 4; Washington 4.

World News Offices: London, Frankfurt, Manila, Mexico City, Paris, Sao Paulo, Tokyo.

Price of this issue 50c. Subscription rates: United States and possessions $3 a year; $4 for two years; $5 for three years. Canada $5 for a year; $8 for two years; $10 for three years. Other Western Hemisphere and Philippines, $8 a year; $12 for two years; $16 for three years.

Elsewhere, $15 a year; $25 for two years; $30 for three years. Please indicate position and company connection in all subscription orders.

Entered as second class matter May 24, 1951 at the Post Office at Philadelphia, Pa. under the Act of March 3, 1879.

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LETTERS

World-Wide Guidebook Comments

● The Editors would like to thank the many readers who took the time to fill out and mail to us the card enclosed in the Mid-March Mining Guidebook, giving us their comments and suggestions how we can improve our 1956 Guidebook. Following are some of the comments received:

A large review of the fundamentals and practice of non-metallics flotation might complete this excellent Guidebook.

Dr. Lauro Rossi
Siracusa, Italy

I was particularly interested in the articles on Flow of Solids and Modern Pumps. The Buyers' Guide section is helpful.

Richard Wachs
Berkeley, Calif.

Ion exchange fits and fluidization technique are very helpful for me and also for all Japanese technicians.

Toshio Nishimura
Kagoshima, Japan

Would like more information on chemical engineering, chemistry, physical and colloidal chemistry, ore dressing, flotation, methods of concentration. The Mining Guidebook is very excellent.

Francisco Chaman
Huancayo, Peru

Especially interested in Ferroalloys and electrometallurgy, and in mining, especially in open cast mining operations, haulage, transport, crushers, etc.

Jal Karani
Gorumahisani, India

Put in composite radioactive detection. This entire subject is so important and so little of value has been published that experience by the individual is all anyone has to go on. You're late in getting out a guide on this subject. I would like to see something before 1956.

H. E. Harvey
Walkerton, Indiana

Give us more on metallurgy of tungsten, molybdenum and rarer metals.

Toshio Miyake
Uji City, Japan

Let's have something on ventilation, lighting, regenerative and dynamic braking for hoists. It's a little disappointing to observe the lack of anything constructive on the safety programs sponsored by the various operators. The subject is not foreign to the field at all, arguments to the contrary not withstanding.

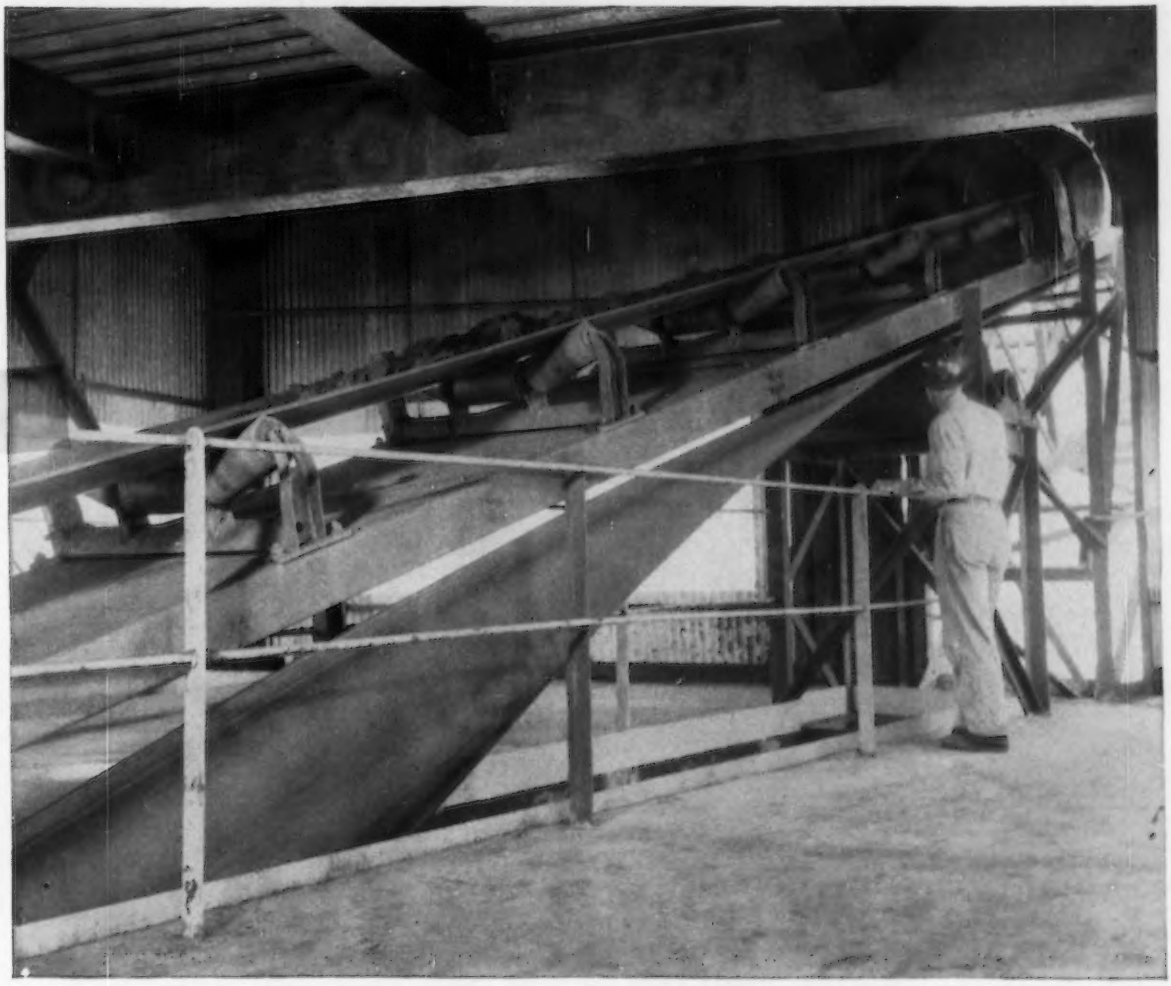
Paul Ziemke
Oak Ridge, Tenn.

Would like to see more on mining and crushing covered in the 1956 Guidebook.

A. A. Molling
Cologne, Germany

(Continued on p 96)

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



How conveyors stay clean even when load is sticky

THAT stuff riding the conveyor belt is refuse from a coal washing plant on its way to a dumping point—550 feet uphill. When plans were drawn up, engineers said the usual conveyor system wouldn't be the answer here. They knew the wet clay and sticky sand would cling to the belt, build up into gummy layers, clog the return idlers and pulleys, and damage the belt cover.

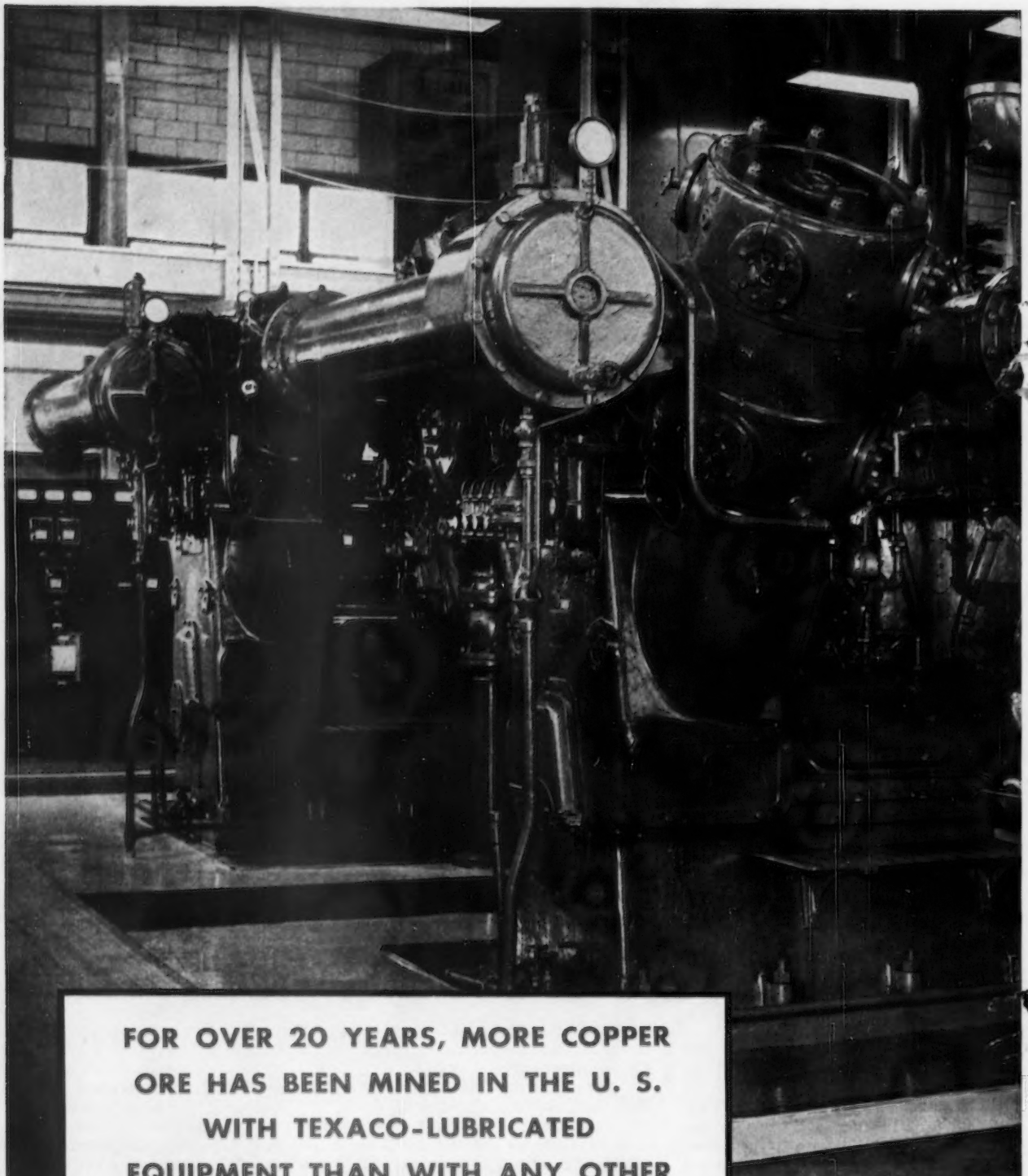
To avoid this trouble, they installed something quite different in conveyors —the B. F. Goodrich "Turnover" belt system. Here's how it works. As the material is dumped off the end of the moving belt, the belt makes a 180° turn, runs empty along the return idlers, then makes another one-half turn (as shown above) before receiving the next load.

Only the clean side of the belt touches the idlers, so there's no chance for sticky materials to build up on them. Even wet materials can be handled in cold weather without danger of the belt freezing to the rotating metal parts.

With the "Turnover" belt, expensive decking can be eliminated. Clean up of spillage is no problem because any material that falls on the lower run of the belt is carried to the end and dumped off when the belt makes its turn. Damage to belt body is reduced because lumps of materials cannot be trapped between the belt and pulleys.

If you have an operation where sticky, freezing or corrosive materials must be moved from place to place, the B. F. Goodrich "Turnover" conveyor system can save you trouble and money. Your B. F. Goodrich distributor can give you full details and show you how easy it is to convert any conventional system into the turnover type. *The B. F. Goodrich Company, Dept. M-469, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION



FOR OVER 20 YEARS, MORE COPPER ORE HAS BEEN MINED IN THE U. S. WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER

TUNE IN:
TEXACO STAR THEATER
starring
JIMMY DURANTE
on television . . .
Saturday nights, NBC.

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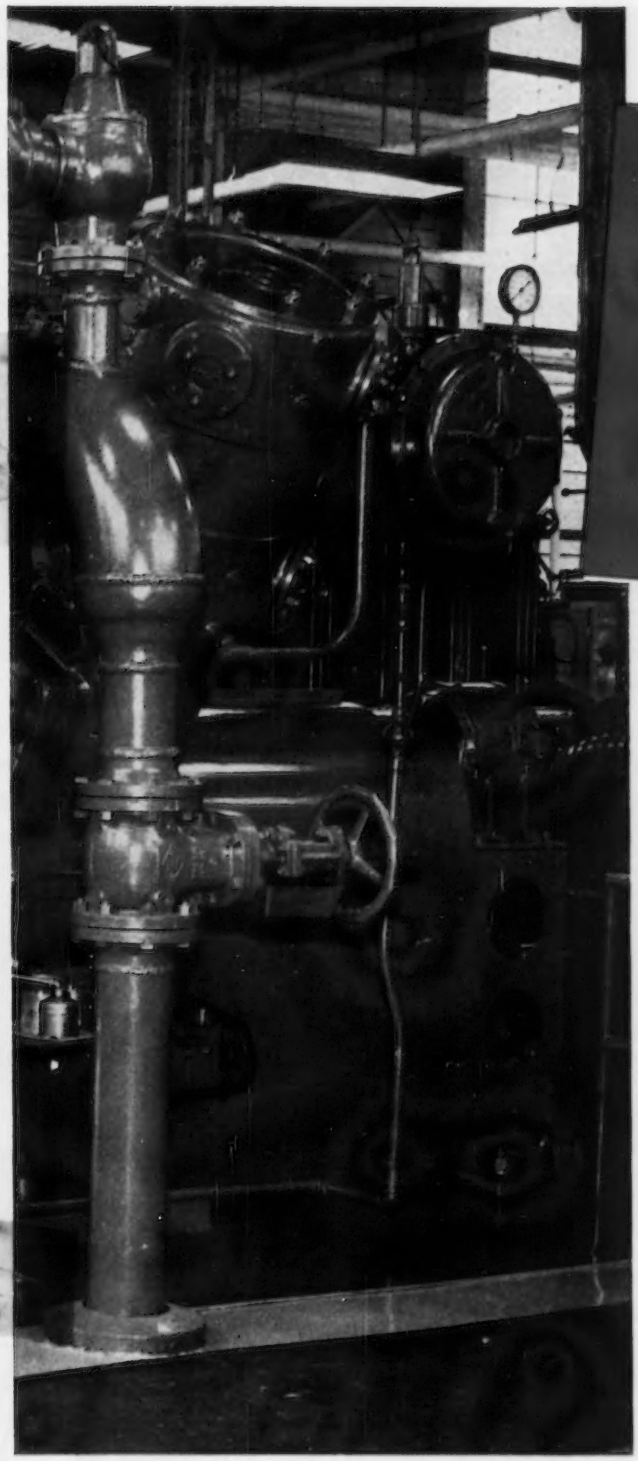


"12 years of clean, efficient operation"

"FOR OVER 12 years," says this user (name on request), "all our air compressors have been Texaco-lubricated and every one of them has shown a remarkable record for clean, efficient operation. Year after year, valves and lines have stayed remarkably free of harmful deposits and our maintenance costs have been consistently low."

There is a complete line of Texaco air compressor oils. Particularly recommended is *Texaco Regal Oil R&O*. It keeps compressors and lines clean and rust-free, assures proper functioning of valves and rings . . . under all operating conditions.

To guard drills against wear and rust, use *Texaco Rock Drill Lubricant EP*. Its extreme pressure properties protect your drills for longer life, keep maintenance costs exceptionally low.

Let a Texaco Lubrication Engineer help you select the proper lubricants for your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
FOR THE MINING INDUSTRY

Dumptor hauls along trestles .

. . or tunnels

without turning

Shuttling back and forth between the loading unit and dump area, Koehring Dumptor travels round-trip without turning. It operates with equal ease in both directions on overhead trestles, in confined underground mines, on open-pit ledges and narrow haul roads. Dumptor gets this unique no-turn advantage through a constant-mesh transmission that gives the same 3-speed travel in either direction.

Every turn eliminated cuts 15 seconds off cycle time. This adds up to a substantial increase in yards hauled per hour. For example, by saving only 2 turns, time studies prove that Dumptor increases hourly yardage output more than 10% on an average 1,000-foot haul.

One-second gravity-dumping also maintains a high rate of production. To dump, operator trips body-release lever, and the 6-yard body instantly tilts 70°. One second later the load is out, and Dumptor is on its way back for the next load. There's no 15 to 25-second wait for slow-acting hydraulic or electric body hoists. What's more, gravity-dump never balks, never wears out.

To learn what these Dumptor advantages can mean in increased production and lower hauling costs on your work, call your Koehring distributor, or write for Dumptor® catalog.

KOEHRING COMPANY

Milwaukee 16, Wisconsin

Subsidiaries: PARSONS • KWIK-MIX • JOHNSON

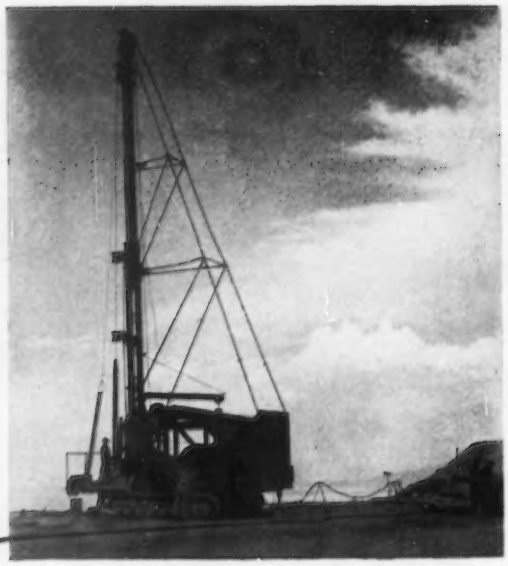
K440

On trackless mining operation, Koehring 6-yard Dumptor goes underground . . . shuttles in and out of access tunnel without turning. This heavy-duty hauler has over 6 h.p. per ton of loaded weight, climbs 24% ramps, grades.

Dumptor puts stockpiling on a fast, shuttle-haul basis. It drives up to edge of pile, body forward . . . dumps, and heads back for next load without turning. Instant gravity-dump action kicks the load out over edge of the bank . . . saves a lot of dozer clean-up on the stockpile.

Big square body opening permits loading over either end or sides. Dumptor above is teamed with Koehring 1½-yard 605 shovel . . . a big-production combination. Other Koehring excavators: ½ to 2½ yards . . . cranes up to 79½ tons.

for LESS COST *per* TON BROKEN



and MORE FEET *per* SHIFT DRILLED

. . . *power your drills with* SELENIUM-NEOPRENE ARMORED *SIMPLEX-TIREX CABLE!*

Sunlight won't crack TIREX Cable.

Samples of TIREX Selenium-Neoprene Armor exposed to continuous sunlight for 20 years show no signs of cracking.

TIREX Cable is not bothered by rain, snow and moisture.

TIREX has worked under water in mines for years without trouble.

Curing in lead makes TIREX Selenium-Neoprene Armor tough, hard and extremely resistant to abrasion.

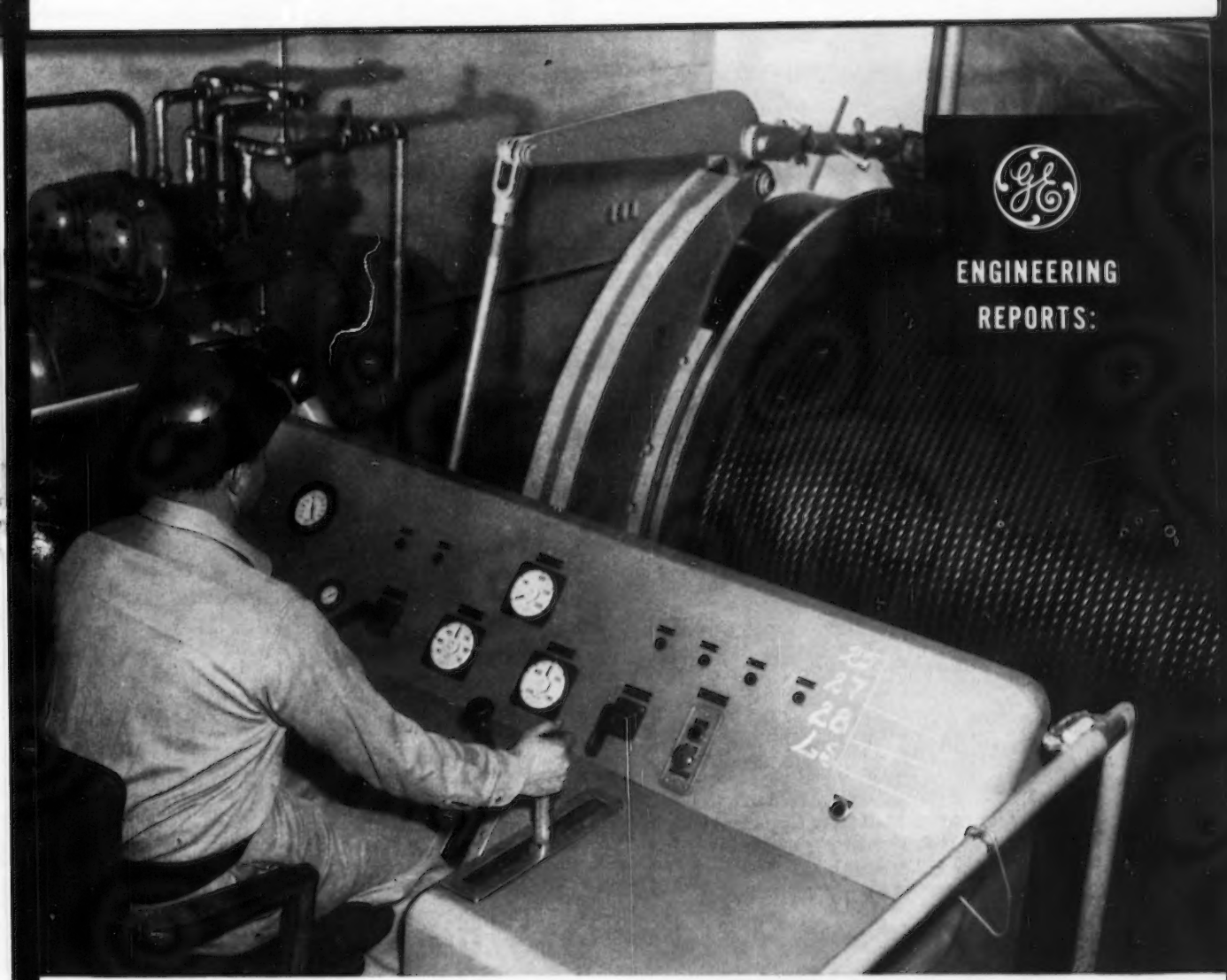
TIREX Cable has been crushed under falling rock and accidentally run over by loaded trucks. It still works dependably.

TIREX is unusually flexible even in below freezing temperatures. It resists acids, oil and flame.

Write today for more details about Simplex-TIREX Cable with Selenium-Neoprene Armor to the address below.

ONLY *Simplex* MAKES SELENIUM NEOPRENE ARMORED TIREX

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.



CUSTOM-BUILT G-E manual or automatic mine hoist drives are available in many types for heavy-duty hoisting.

G-E electrical systems and equipment help you . . .

Mechanize underground mining for more tonnage at lower cost

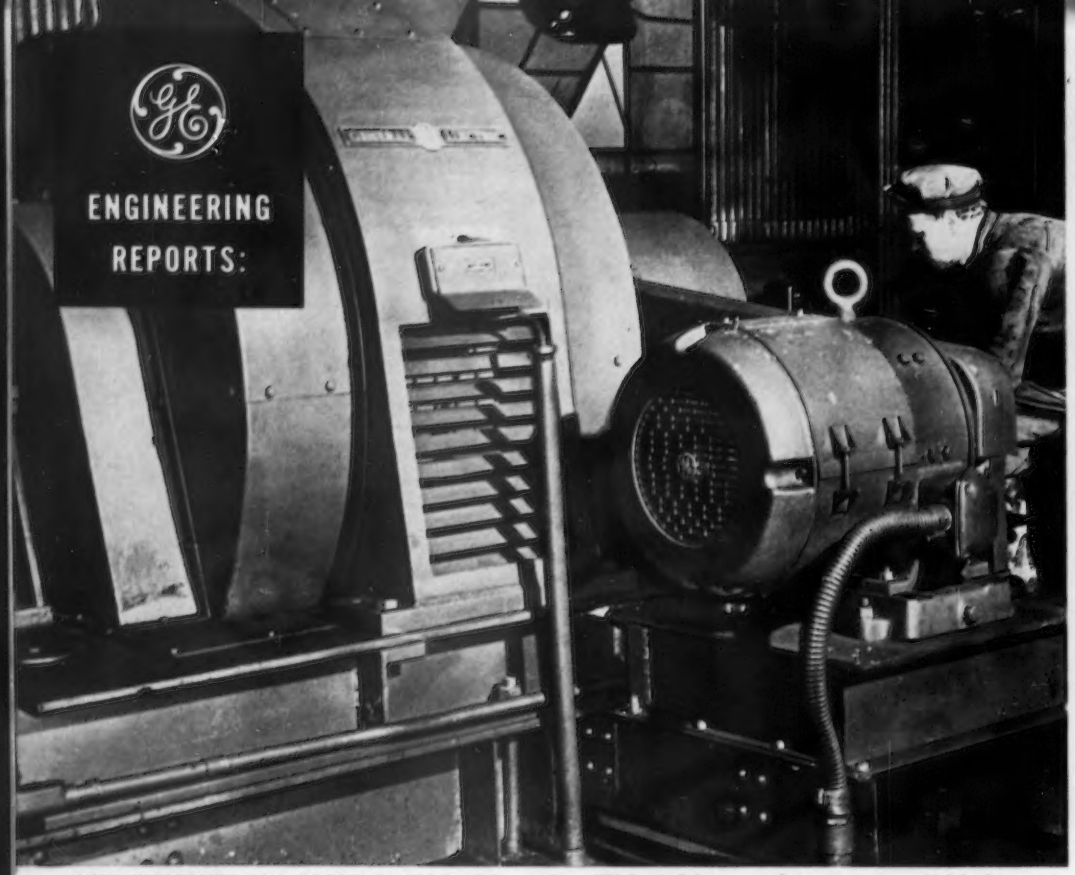
As market conditions change, underground mines must produce more, faster, and more efficiently, to improve their competitive position. Key to this objective is increased mechanization, with General Electric's help.

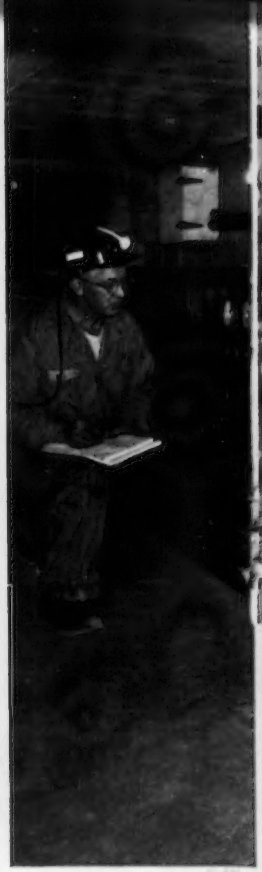
You benefit many ways when you specify G-E electrical systems and equipment. Advantages like these can play an important part in your mine mechanization program:

- **FACTORY-ASSEMBLED** G-E power-system equipment cuts installation time and cost, speeds new construction and start-up.
- **SPACE-SAVING** G-E electrical equipment adapts readily into existing systems, can be expanded easily, at low cost.
- **LOW-MAINTENANCE** G-E drives are designed to last longer, provide more horsepower in limited space, with maximum accessibility for servicing.

TURN PAGE FOR MORE PRODUCT INFORMATION

GENERAL ELECTRIC

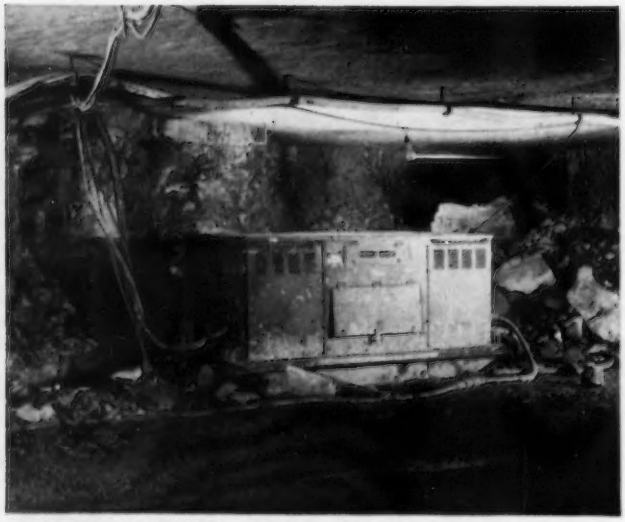




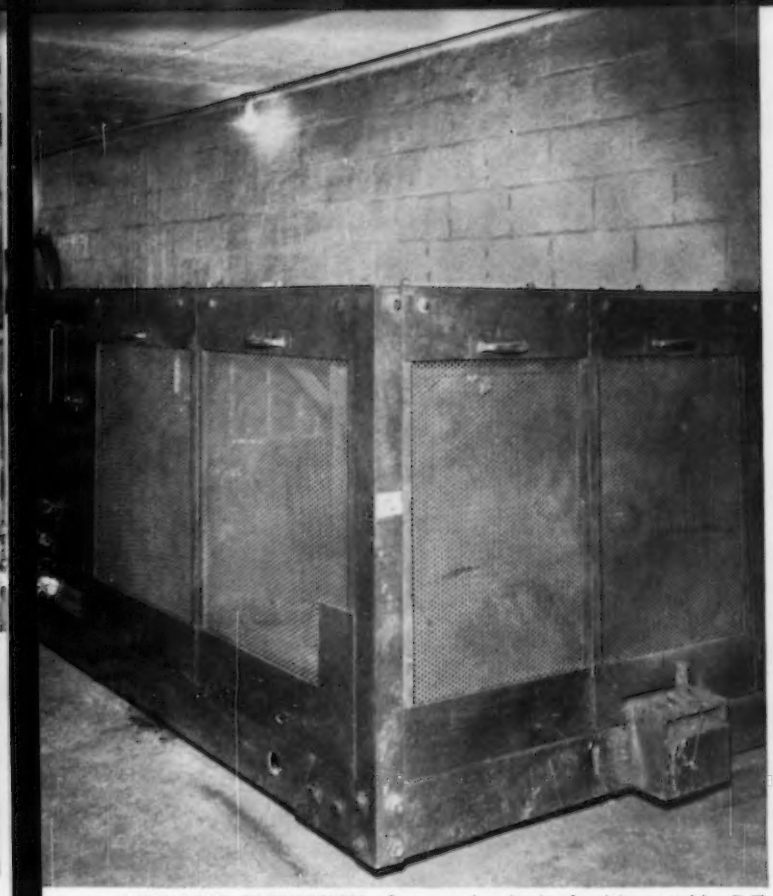
HIGH EFFICIENCY AND POWER FACTOR of General Electric synchronous conveyor or compressor motors cut electrical losses, and can reduce power rate. High and low speed types are available in many sizes, with just the required type starting, pull-in, and pull-out torque.

System-engineered raises efficiency of

CONTINUITY OF PRODUCTION and flexibility of operation are promoted by G-E metal-clad switchgear. Factory-assembled, it is easily installed and maintained.



MORE DEPENDABLE G-E a-c mine power supply, used underground, steps down voltage close to the mining load, minimizing voltage drop, increases the efficiency of your mining machines.



LOW COST CONVERSION of power is obtained with portable G-E mining-type mercury-arc rectifiers. Move easily as face advances. Absence of major rotating parts reduces wear, shutdowns.

SPECIALLY DESIGNED for service reliability, rugged G-E totally enclosed fan-cooled Tri-Clad* motors are also available in design approved by Bureau of Mines.

G-E equipment underground mining

Modern General Electric equipment can give you the speed, flexibility and safety you need for more efficient underground mining. G.E. can also help in these ways:

Latest electrical techniques are employed by G-E application engineers, working closely with you or your consultants, to give you the most flexible and lowest-cost system for your mining needs.

Extensive developmental facilities are constantly used by G-E product engineers in providing new and improved products to help you increase mining output and efficiency.

From early plans through start-up, G.E. can co-ordinate selection, delivery and installation of all your electric equipment, saving you engineering time and construction costs. For more information, contact your nearest G-E Apparatus Sales office, or write General Electric Co., Schenectady 5, N. Y. 660-33

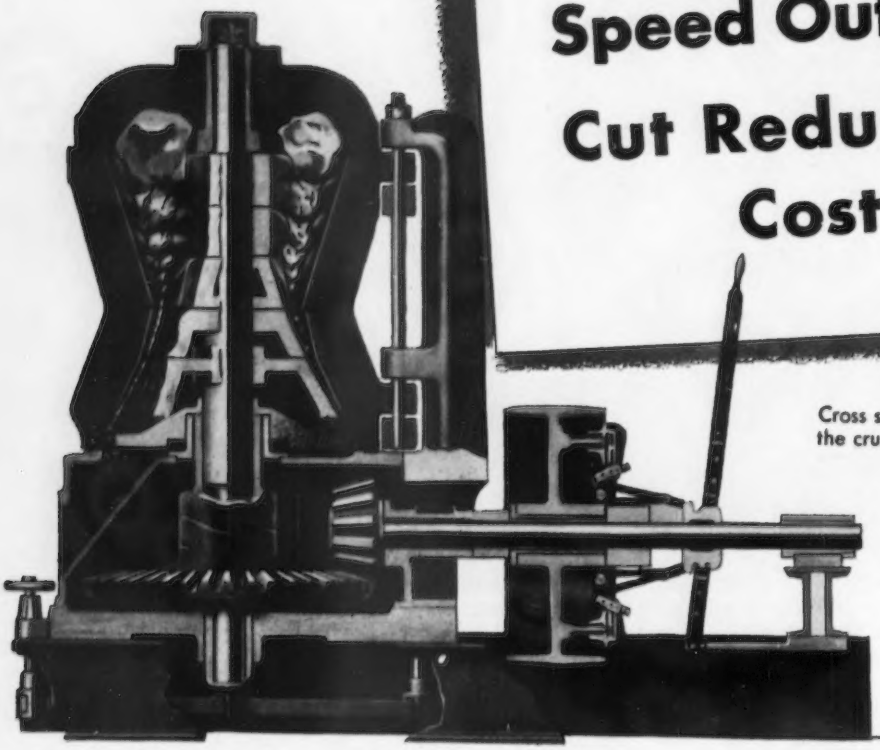
HIGH AVAILABILITY of G-E mine locomotives cuts costs. G.E. offers a variety of types which handle easily, efficiently, and help speed all haulage in underground mines.

*Reg. trade-mark of General Electric Co.

Engineered Electrical Systems for Underground Mining

GENERAL ELECTRIC

Here's How to Speed Output... Cut Reduction Cost



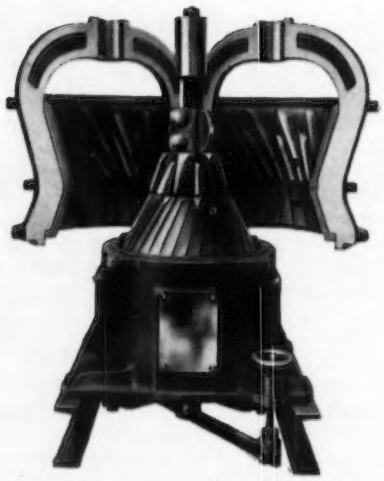
Cross section view illustrating the crushing action.

Use STURTEVANT Rotary Fine CRUSHERS

With the Sturtevant Rotary Fine Crushers you can crush or granulate to even sizes without excess dust. By simply turning the handwheel, the crusher can be quickly regulated to crush down to approximately ¼" and finer, or opened up to produce 1" size of finished product.

"Open-door" accessibility permits fast, easy, thorough cleaning.

Sturtevant Rotary Fine Crushers crush fast... do not clog. Available in output capacities from 1 to 30 tons per hour.



Sturtevant Mill Company

101 CLAYTON STREET, BOSTON 22, MASSACHUSETTS

Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS
CONVEYORS • MECHANICAL DENS and
EXCAVATORS • ELEVATORS • MIXERS

1,116,071 tons of ore in 24 months

Unloading new Northwest Model 6 far trip to pit.

This Model 6 has been in the Granby Pits for 24 months with only 3 hours "down time."

FROM
July 6, 1953 to July 6, 1955:

Total shifts	752
Total tonnage ore and waste moved	1,116,071
Average tons per shift	1484
Total down time	3 hours

WE'VE SEEN A LOT OF RECORDS but this one is really among the topmost of them all. The illustrations show the pits of the Granby Consolidated Mining, Smelting and Power Co., Ltd., of Copper Mountain, B. C.

The copper ore is being handled by two Northwests, Model 6's. The older of these two rigs went into service July 6, 1953, and as of July 6, 1955, it has been in the pits for 24 months. During that time it has loaded out 1,116,071 tons of ore and waste. Not only has it accomplished this tremendous production but it has done it with only three hours of "down time". Much of the credit for this high output goes to J. B. Logan and his crew of the J. B. Logan Construction Co. of Princeton, B. C., who are contracting the loading of the material. Their personal interest in the job has played a big part in getting the best out of the equipment. One of the most remarkable things about the performance is that Mr. Logan has moved all this material with only 4 sets of shovel teeth and still has the original four sets, less one tooth. The teeth are retipped and he gets 30 days single shift with each set of reconditioned teeth.

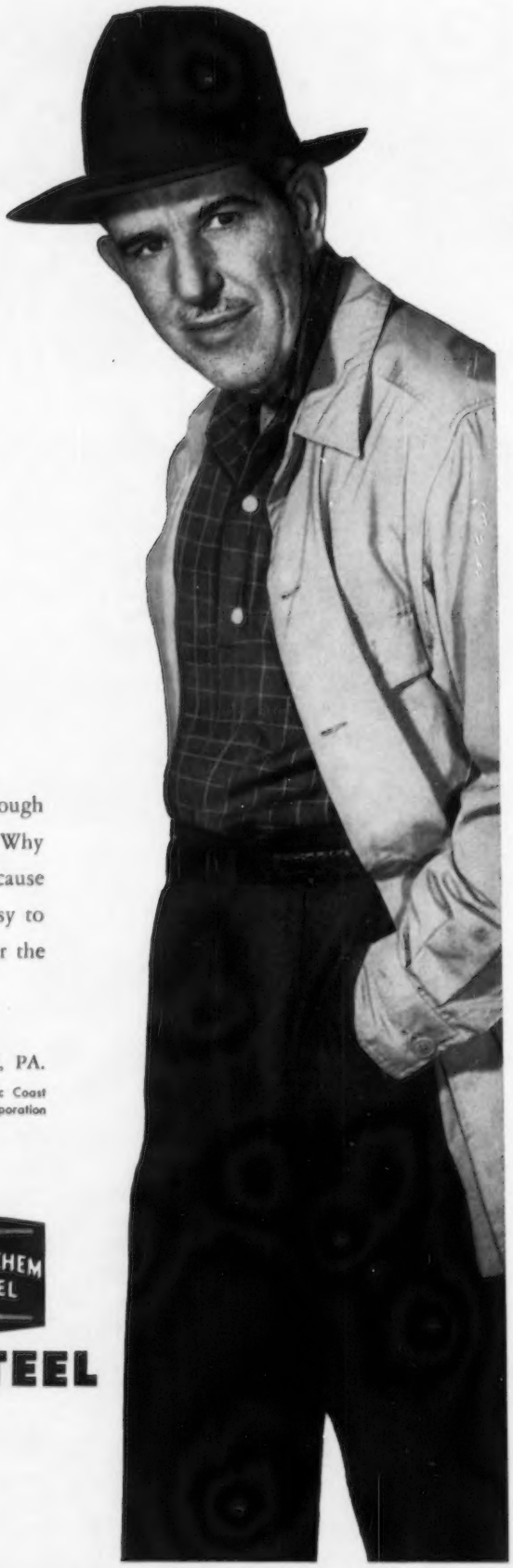
NORTHWEST ENGINEERING COMPANY
1509 Field Building, 135 South La Salle Street
Chicago 3, Illinois

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

YOU CAN'T HAVE NORTHWEST ADVANTAGES UNLESS YOU OWN A NORTHWEST

"It's good, sound drill steel"



"I've been working with drilling crews long enough to know that it pays to use Bethlehem Hollow. Why do I like it? Well, it's tough, and it saves money because there's little breakage. And my boys say it's easy to heat-treat, whether they use the carbon grade or the alloy. What better reasons can there be?"

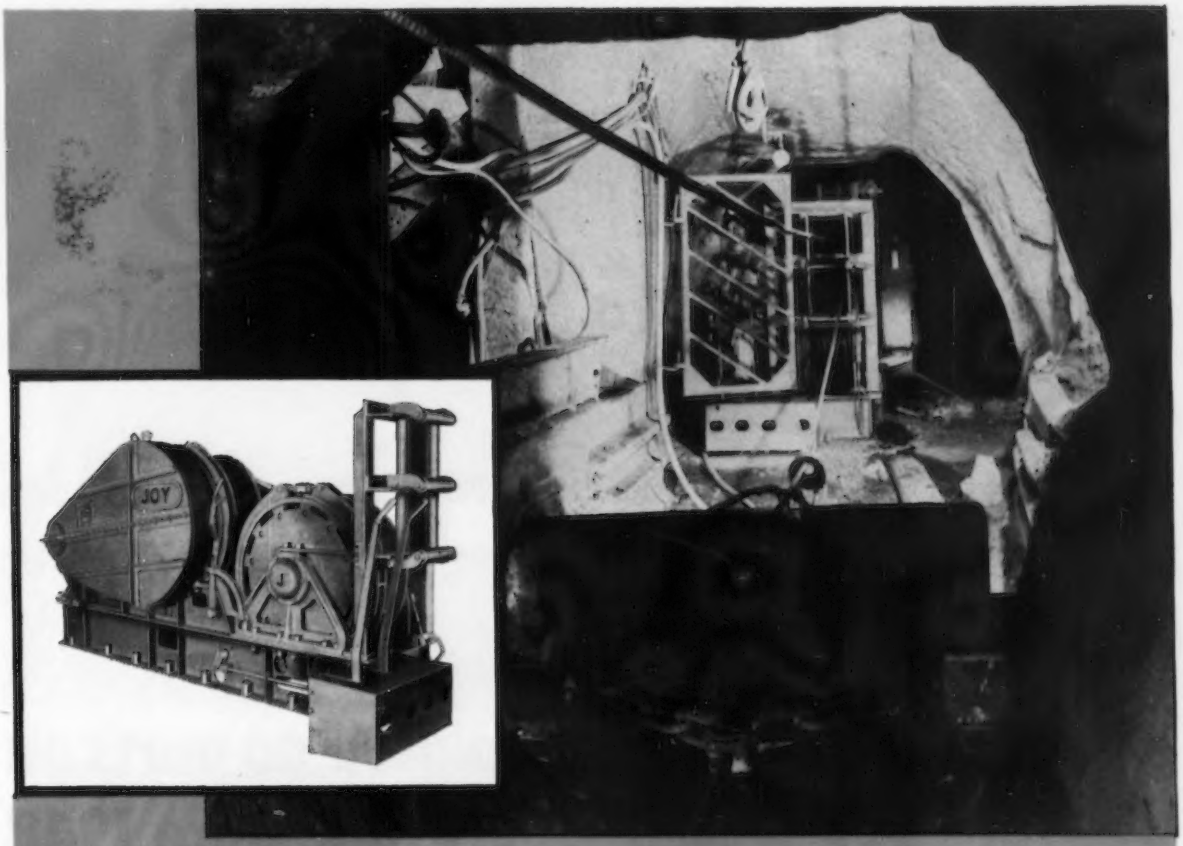
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM

BETHLEHEM STEEL

HOLLOW DRILL STEEL



BIG JOY EQUIPMENT is the PAYOFF at CLIMAX

A mining system built around the use of high-capacity, heavy-duty scraping equipment has been the payoff at Climax. Block caving into slusher drifts, which will accommodate a 6′ folding scraper, has resulted in a saving of up to half of the cost of gravity-chute ore collection methods previously employed.

The 150 HP Joy XT-221, a large tandem two-drum slusher with chain drive, is used at Climax for this high-capacity slusher operation. Many of these heavy-duty machines work on a three-shift basis yet with remarkably low maintenance. During the loading of the first 3 million tons of ore from the Storke Level at Climax by 23 Joy XT-221 Slushers, *the only repair charge was for clutch band linings.*

The Joy XT-221 is the largest model in a complete line of rugged scraping equipment expressly built for heavy underground duty. The line ranges from the 5 HP Model S-221 to 150 HP units such as the one illustrated above in a Climax drift, and includes models which will solve most scraping problems. For complete information on Joy Slushers, write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

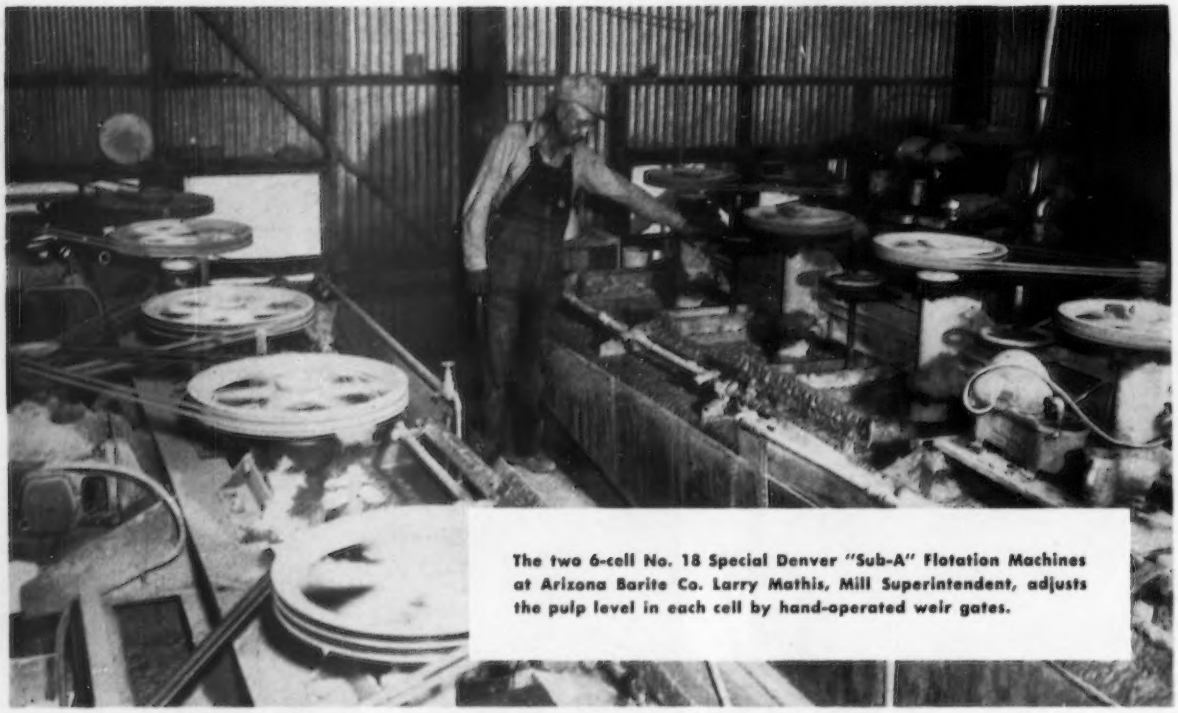
Consult a Joy Engineer

for AIR COMPRESSORS, ROCK DRILLS, CORE DRILLS, HOISTS and SLUSHERS, MINE FANS and BLOWERS

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

W&O M5737



The two 6-cell No. 18 Special Denver "Sub-A" Flotation Machines at Arizona Barite Co. Larry Mathis, Mill Superintendent, adjusts the pulp level in each cell by hand-operated weir gates.

Arizona Barite Co. has replaced no parts on Denver "Sub-A's" in operation since 1948

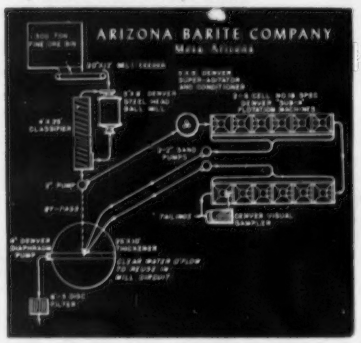
"Arizona Barite Co., Mesa, Ariz., installed a 6-cell No. 18 Special (32 x 32) Denver 'Sub-A' Flotation Machine in June, 1948, for roughing. At the same time, we added a second 6-cell No. 18 Special Denver 'Sub-A' Flotation Machine for cleaning. Due to the conditions of the ore, this setup was not practical, so the 'flexibility' feature of the Denver 'Sub-A' Machines was used to hook them in tandem.

"Since the original installation, no wearing parts have been replaced after 47,450 hours of continuous operation. The only maintenance has been replacement of V-belts and lubrication. We estimate another two years' wear on impellers before replacement is necessary."—Larry Mathis, Mill Superintendent.

This is a specific example of one of the reasons why mill operators depend upon Denver "Sub-A" Flotation Machines for hard, continuous operation, as well as high metallurgical efficiency. The same high profit operation is available to you.

If you are interested in the low maintenance features and metallurgical efficiency features of Denver "Sub-A" Flotation Machines, write for DECO Bulletin No. F10-B81. If you are interested in the complete story on "Benefication of Barite at Arizona Barite Company," write for Engineering Notebook Bulletin No. M4-B56.

An interesting note here is that the Denver "Sub-A" Flotation Machines are operated in series and each cell produces a finished $BaSO_4$ product without cleaning or recleaning, due to the selective action of the Denver Flotation Machine. A higher grade product can easily be made by cleaning the concentrate. Part of the present cells could be devoted to the cleaning action when necessary. This flexibility enables them to easily take care of any changing requirements in their product.



*

*The Denver Visual Sampler, installed at the tail end of the flotation section, paid for itself in two weeks.

DENVER MACHINES PAY OFF

"The firm that makes its friends happier, healthier and wealthier"

DECO FLOTATION ENGINEERING — DENVER EQUIPMENT COMPANY 24 HOUR SERVICE

DENVER EQUIPMENT COMPANY

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Heads Together

At Allis-Chalmers, Integrated Thinking Precedes the Application of Your Integrated Equipment

Allis-Chalmers designs and builds diversified yet completely integrated lines of processing machinery as well as electrical generation, distribution and utilization equipment.

Take a look at the various product departments at Allis-Chalmers and you'll find engineering offices set up for *each* product line. Peek into conference rooms and chances are you will see members of these specialized staffs huddled on application problems . . . exchanging ideas . . . correlating specific know-how and skills.

This proven approach — for which Allis-Chalmers has long been famous — results in truly integrated equipment . . . installations with the various components matched for maximum efficiency at low cost. A-4728

MORE ABOUT ALLIS-CHALMERS INTEGRATION ON FOLLOWING PAGES.

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

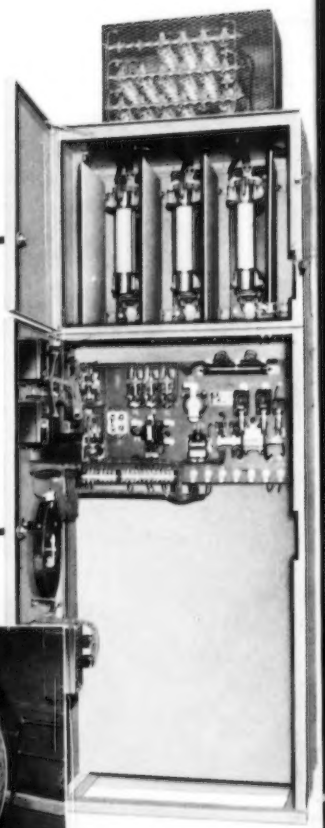
Allis-Chalmers *Teamed Up* for

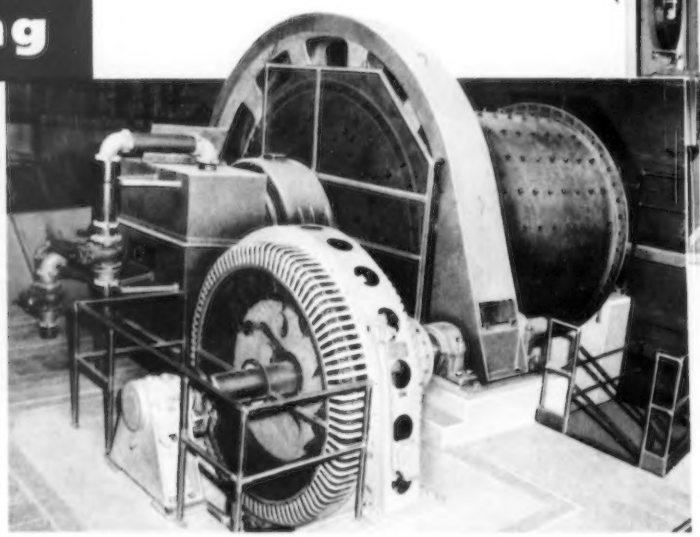
Grinding

BEFORE A RECOMMENDATION IS MADE, requirements and variables are given a careful going over by an Allis-Chalmers team comprised of *grinding*, *motor* and *control* engineers. Characteristics of material, capacity, feed preparation, balance of gradations, torque characteristics, system power factor needs, control requirements are some of the many factors evaluated. Experience has proved that this thorough pre-application investigation and preparation pays off to the purchaser . . . *pays off in maximum capacity of desired product per cubic foot of mill volume.*

A Typical Integrated Grinding Mill Installation

In a recent application, the mill installed was a 10½ by 12-foot Allis-Chalmers diaphragm ball mill. The close diameter-length ratio is an important factor in producing the highest possible capacity per unit of power. Driving the mill is a 900-hp, 4000-volt, 257-rpm, .8 pf Allis-Chalmers synchronous motor. By providing desired power factor correction, this motor reduces power cost. The Allis-Chalmers starter is specially engineered to provide protection under all conditions of grinding operation.





Modern Electrical Distribution Systems Cut Costs

Allis-Chalmers unit substations can be strategically located to bring high voltages near load centers with resultant economy in cable cost, minimum line loss and efficient voltage regulation. Illustrated is Allis-Chalmers switchgear installed underground where it serves motors driving crushers, compressors, shovels and drills.

At Allis-Chalmers, electrical and mechanical engineers combine their skills and knowledge in coordinating the electrical distribution system with processing equipment when working out an efficient product flow.

This integrated effort results in maximum plant efficiency — reduces installation and power costs.

Equipment

Profitable Production

TODAY, WITH SUCH FACTORS as high kw consumption, frequent lengthy outages and costly maintenance disturbing the profit picture, the advantages of integration deserve prime consideration. For example, let's take the problem of cutting cost in a crushing installation.

Special Control Circuit

Drawing on 75 years' experience in building and applying crushers, Allis-Chalmers control *and* crushing engineers developed a control circuit designed to cut costly downtime for the crusher installation shown below. In this circuit, motor overload protection is provided by *two* sets of thermal overload relays. One set operates at slight overload to sound warning. The second set stops the motor when temperature reaches the danger point.

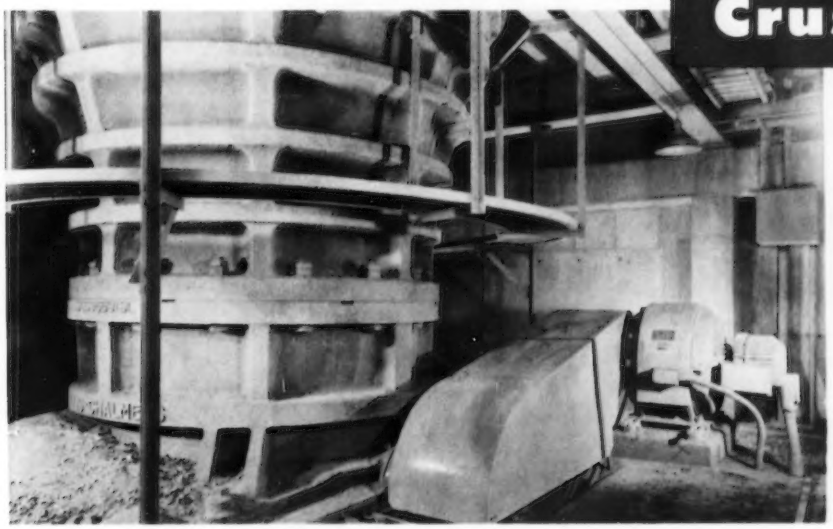
Because of high starting torque and frequent starting under load, an Allis-Chalmers wound-rotor motor is used. In calculating hp requirements, the factors of crushability, ratio of reduction, product size and specific gravity are evaluated.

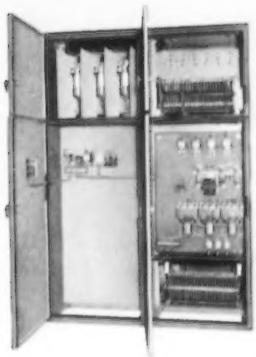
Flexibility in the Crusher

The crusher is the *Superior* gyratory crusher which features hydraulic positioning of mainshaft and mantle. This control facilitates emptying crushing chamber in case of power failure or other emergencies. It also compensates for wear on concaves and mantle and, when required, changes product size instantly. In Allis-Chalmers gyratory crushers, changing eccentricity, speed, or shape of chamber varies capacity and product size. This flexibility permits synchronizing crushing with other operations.

Superior is an Allis-Chalmers trademark.

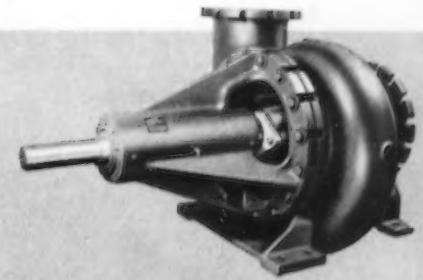
Crushing





Solids Handling Pump Built to Resist Abrasion

Here is a pump specifically designed to meet the problems of mineral processing. Rugged construction featuring the use of abrasion-resisting materials provides longest possible service life. Because some wear is inevitable in handling mineral solids in suspension, inspection and maintenance have been made easy.



A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Your *Dollar Buys More* when you invest in Allis-Chalmers Integrated Equipment

Because:

- Integrated units or processes evolve from a co-operative engineering effort — all Allis-Chalmers components are matched for top efficiency.
- New as well as *existing equipment* is integrated into a smooth, productive, profitable operation.
- Allis-Chalmers assures undivided responsibility for performance — there is no "buck passing" as frequently prevails when components are purchased from more than one source.
- No other company can provide the background of experience gained through the years of solving thousands of equipment integration problems . . . in research...in testing...in pilot plant operation.
- Modern laboratory facilities, periodic equipment checkups and fast emergency service from a large stock are always available.

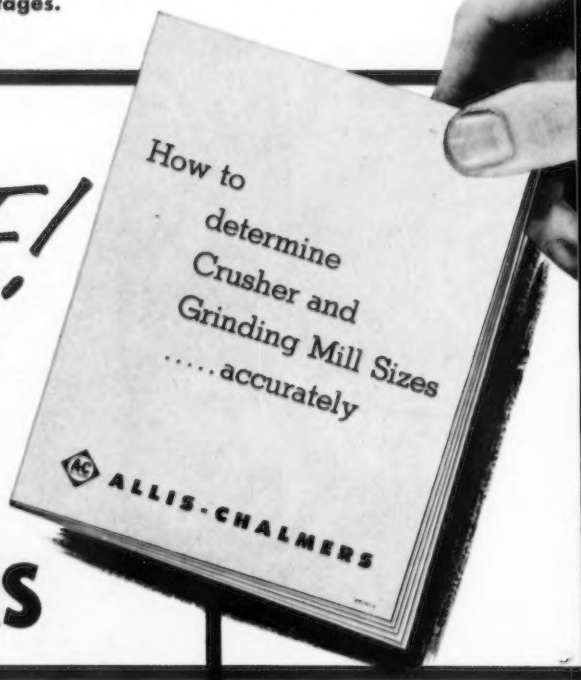
Cost is more than a matter of price tag. Be sure you are getting all the above advantages.

Only from Allis-Chalmers ...and it's *FREE!*

Nowhere else can you get this valuable book at any price!

The Third Theory of Comminution, or *work index* method, is a compilation of factual data on crushing and grinding obtained in over 35 years of field and laboratory testing. Correlating this information made it possible to establish a consistent common factor called the *work index*. Knowing the *work index*, you need only apply a given equation to determine required power input. The calculated power input enables you to select the proper crusher or mill for your job.

This practical formula, together with more than 1200 tabulated work indexes, is now available in a 72-page bulletin (07R7995). For your cost-free copy, see your Allis-Chalmers representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.



ALLIS-CHALMERS

ALLIS-CHALMERS *INDUSTRIAL EQUIPMENT DIVISION*
Milwaukee 1, Wisconsin

Send me the following bulletins:

- 25C6166D, a mining industries catalog
- 07R7995, Third Theory of Comminution

I would also like bulletins on:

_____

Explanation of Process or Problem _____

_____
(Type of Equipment)

Name _____ Title _____

Company _____ Address _____

City _____ Zone _____ State _____ A-4728

WRITE FOR LITERATURE

Bulletin 25C6166D covers all equipment manufactured by Allis-Chalmers for the mining industries. Individual bulletins covering specific equipment lines are also available.

NEW H-5

1/2-YD., 9-TON

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

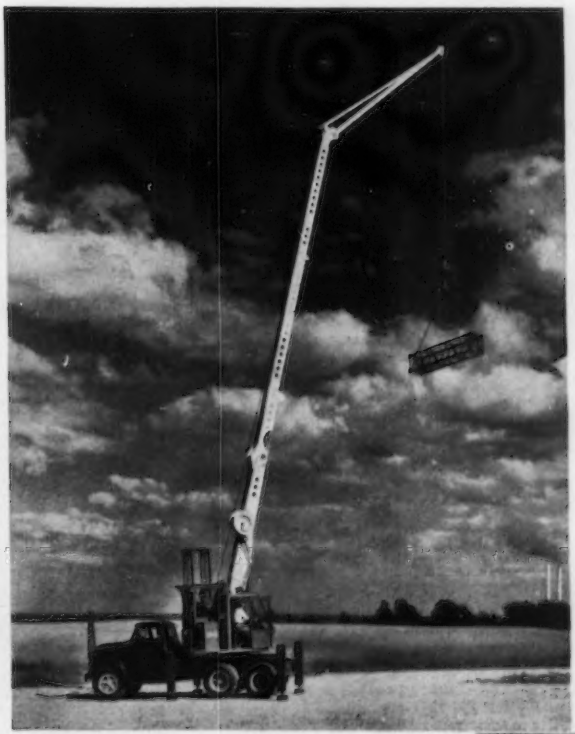
Gentlemen:
Send me your new H-5 Bulletin. This crane interests me for _____ work.
(type of job)

Name_____
Company_____
Title_____
Address_____
City_____ State_____

91H55

Hydrocrane Mounts on Conventional Truck

Completely new from outrigger feet to boom tip, this powerful 9-ton, ½-yd. Hydrocrane brings you work ability of heavy carrier-mounted cranes at small crane cost. Patented hydraulic outriggers permit mounting crane-excavator on a commercial motor truck, new or used, without sacrificing any basic crane working capacity.



Check these outstanding advantages—

Unmatched precision control of loads.

High-lift, three-piece boom (extra equipment at added cost) gives you 50 feet of reach, retracts hydraulically to 25 feet for travel. Boom and hydraulic fittings can be connected and machine working in less than ten minutes after arrival at job site.

12-ft. telescoping boom action—from 24 feet to 36 feet for standard two-piece boom, from 38 feet to 50 feet for high-lift boom, plus 20-ft. jib extension.

50-mph top highway speed.

Every work function fully hydraulic.

Up to 240-fpm line speed.

Available with clamshell, crane hook, magnet.

Optional remote truck control from crane cab.

Meets highway laws for over-all length and axle loads (depending on truck selection).

See it in action

Find out what the new H-5 Hydrocrane can do for you. Ask your Bucyrus-Erie distributor for a demonstration.

BUCYRUS-ERIE COMPANY
1880 South Milwaukee, Wisconsin **1955**
75 Years of Service to Men Who Shape the Earth

New truck, inexpensive used truck, a truck you now own—the new H-5 Hydrocrane can be mounted on any standard commercial truck you choose.

INTEGRAL TYPE — Designed for production drilling, the Integral Type is used in combination with the CP-32 AW Sinker for general Airleg work and the CP-59W Sinker for the harder formations and deep-hole drilling. Available with feed cylinder of aluminum alloy. Has push button release at both ends of the sinker handle.

these two CP

ATTACHABLE TYPE—Converts standard CP Sinkers for lateral or overhead drilling. Used with the CP-39 Sinker for soft to medium formations; the CP-32A Sinker for general Airleg work; the CP-59 Sinker for hard formations or deep-hole drilling. All sinkers recommended for use on Attachable and Integral Airlegs are available with optional hooded front head that reduces weight and prevents chuck spray.

Airlegs make every bit count!

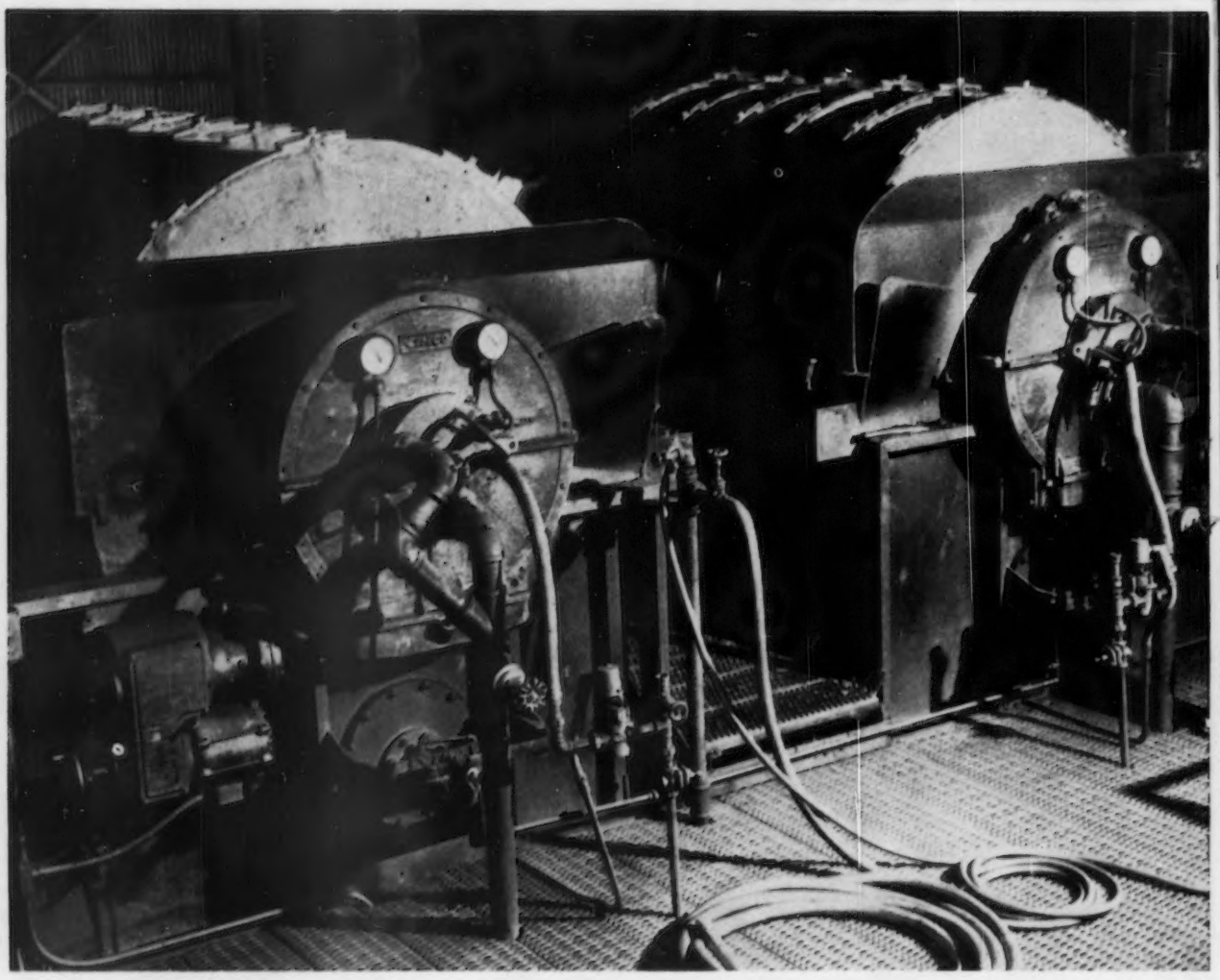
That's right! CP Integral and Attachable Airlegs get the most out of efficient Tungsten Carbide bits. Here's why: CP Airlegs' exclusive pressure release type control handle and balanced feed leg apply steady bit pressure even when line pressure or rock formations vary. The leg takes constant recoil shock, holds the drill firmly to the work . . . eliminates slapping and reduces costly bit breakage. An emergency push button instantly releases feed leg pressure. Available in *Attachable* types for conversion of standard sinkers to Airleg operation and in *Integral* types for production drilling . . . both in standard feeds of 36″ and 48″.

Chicago Pneumatic Tool Company,
8 East 44th Street, New York 17, N. Y.

INTEGRAL TYPE is quickly changed over for regular Sinker drilling. Operator simply loosens quick-disconnect nut on the Airleg, dismounts the Sinker and adds his "T" handle.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



REDUCE COSTS AND

Eimco equipment helps to reduce costs and increase production at Climax Molybdenum Company property at Climax, Colorado.

This is one of the world's great mines, more than two miles above sea level and with the record for high tonnage production on a per man shift basis.

One of the pieces of equipment used to obtain high tonnage production is the Eimco Folding Scraper. This scraper was developed at Climax by Climax people and its use permits loading ore into cars at a rate of 16 tons per minute from one slusher drift.

In the development headings, dependable Eimco air-powered 12B, 21 and 40H RockerShovels load out the broken material to keep development on schedule.

Along the main haulage ways, especially at loading stations, cleanup is maintained by a trolley type electric powered Eimco 40HE RockerShovel. This loader has a power swing to clean the full width of the drift and the trolley permits it to transport itself quickly around the mine.

In the mill, Utaloy liners are among the brands

EIMCO BRANCH OFFICES AND AFFILIATED COMPANIES

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

INCREASE PRODUCTION

employed as mill linings. Utaloy liners are molybdenum — chrome alloy steel, carefully heat treated. Marquenching in molten salt assures uniform hardness throughout liner sections up to 8 inches in thickness.

Eimco Agidisc filters are at work dewatering the concentrate in the mill. This recent installation handles 350,000 lbs. of concentrate per 24 hour day. The Eimco filters operate automatically and require only periodical inspection. They require less than 50% of the floor space used for the equipment they replaced, have reduced the moisture content in the cake by 33%, and increased the filter rate by more than 15%.

Eimco equipment will help to increase production and reduce costs in your mine and mill. Specialized equipment to meet your requirements in loading or filtration has been developed to meet the needs of industry. Call an Eimco engineer to help you specify the equipment best suited for your job. There is no obligation.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

B-134

New MARCY*

pulp density scale

gives

DIRECT READINGS of

- weight of sample in grams or kilograms
- specific gravity of liquid; specific gravity of pulp
- percent solids contained in a pulp of any given specific gravity
- specific gravity of dry solids

With the new Marcy Direct-Reading Pulp Density Scales you simply hang filled container on scale hook and read information direct from dial... requires no reference to separate charts or tables; saves time and eliminates errors in calculations.

accurate ... equivalent to a 47" beam balance in accuracy.

clean ... glass covered dial keeps dirt from affecting accuracy. Dirty hands can not contact the weighing unit, therefore dirt does not deposit to destroy scales' accuracy. Cylindrical plastic container is easy to keep clean.

plastic container ... is inert to action of alkalis and acids; will not dent.

wide range ... applicable over any range of solids, light or heavy density.

color identification ... containers are available in 4 colors to permit easy identification of different samples.

*Marcy is a registered trademark.

GENTLEMEN:

Please send me complete data and prices on your Marcy Direct Reading Pulp Density Scales.

Name.....

Company.....

Address.....

.....

The Mine & Smelter Supply Co.
DENVER 17, COLORADO

Rear-Dump hauls heaped load along narrow dike top. Note network of dikes and pumped-out areas behind the machine. Normally, off-shore ore deposits like these are excavated from below the water by floating dredges. These cannot be used here at Bangka because of the great number of huge boulders located on the sea bed.

How Indonesia moves ocean to mine tin

ABOUT 300 miles southeast of Singapore, off the Indonesian island of Bangka, lies a network of dikes similar to those in the Netherlands. The purpose of the Indonesian dikes is far different, however, from those in Europe. In the Pacific, dikes are built of sand, stabilized by a mat of thick vines. They form a honeycomb of coffer-dams which enclose large areas of shallow sea water. The water is pumped out, uncovering the sea bottom with its rich tin deposits for mining by conventional dry-land methods. The mining is comparatively easy; the complicated part is constructing the dikes. All material must be hauled along tops of existing dikes which are so narrow and uneven that a vehicle is often in danger of skidding off into the sea.

Rear-Dumps haul 11,100 yds. monthly

Mine officials first tried ordinary trucks to do this hauling. They proved unsuitable. They could not turn on the narrow dike tops and their small tires could not develop enough traction for safety. Then three 9-ton D Tournapull Rear-Dumps were brought in. Their electric controls, positive power steer, big low-pressure tires, and 4-wheel air brakes gave operators perfect safety on the slippery narrow dikes. Shovel-loaded, these LeTourneau-Westinghouse rear-dump units carried 7 cubic yards of sand per trip. They hauled rapidly, and turned easily within a radius of 12 ft. 1 in. When haul was 1½ miles one-way, they moved 11,100 bank yds. of sand per month. All 3 Rear-Dumps worked to great satisfaction despite the difficult job conditions and corrosive sea salt.

Order 16 additional units

Because of Tournapulls' dependability and fast, steady production, the management of the Bangka Tin Mines was able to complete construction of the dikes in time before the monsoon season began. With results like these, the mining management has ordered 16 additional 9 and 18-ton Rear-Dumps for use in open-pit tin mining on the island.

If you too have problems in speeding up on your earthmoving — or in hauling over rough narrow roads — or in reducing maintenance costs, it will pay you to investigate the modern, high-speed Tournapull. There is a size machine to fit your needs — 9, 18, 35, and 50 tons.

Tournapull—Trademark Reg. U.S. Pat. Off. DR-341-M-b

LeTourneau - Westinghouse Company

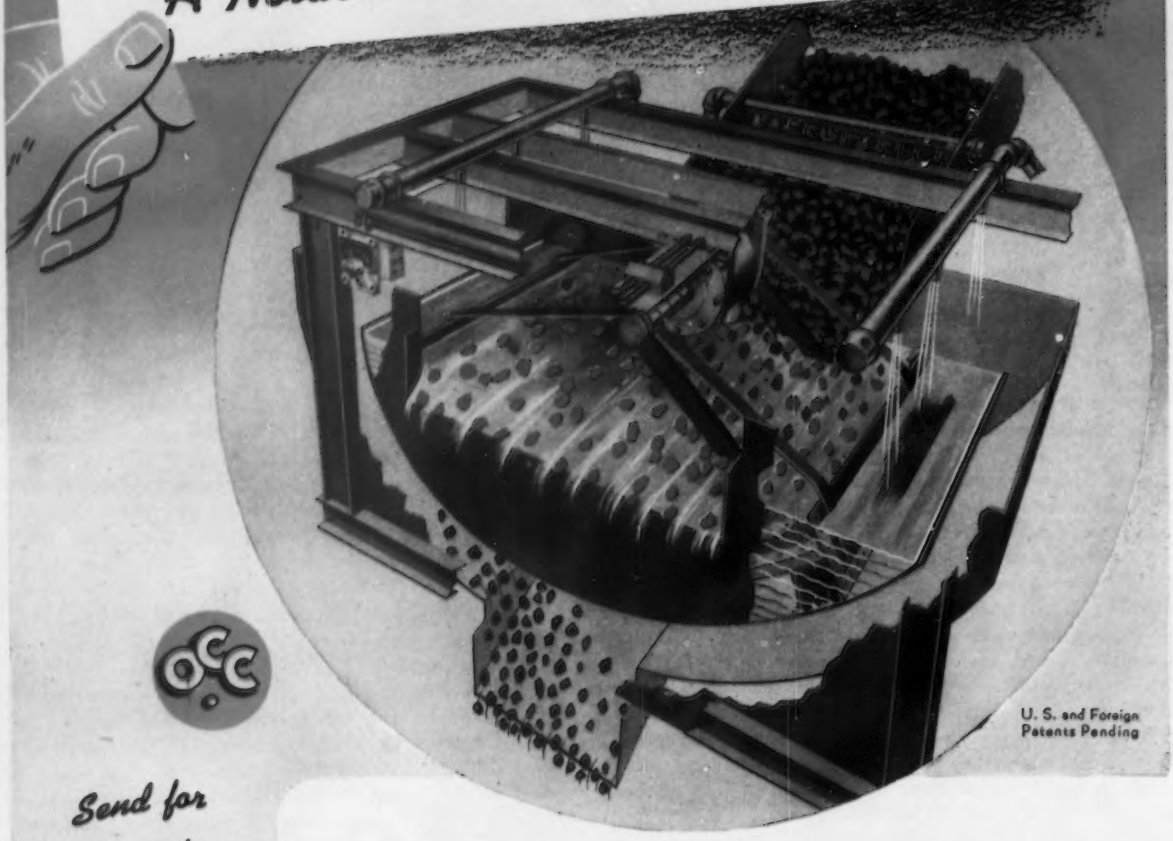
PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

We Invite You to Investigate

THE NEW 'OCC' VESSEL

A Notable Development in HMS



U. S. and Foreign Patents Pending

Send for Information on Complete Pilot Plant Demonstration and Testing Services

OCC VESSEL INTRODUCES UNPRECEDENTED SIMPLICITY

The new OCC vessel represents the successful realization of the main advantage of the HMS process: -- its utter simplicity. The simplicity and efficiency of the OCC vessel are shown by these 6 noteworthy features: --

- High separating efficiency.
- Low operating, maintenance costs.
- No rotating parts in the medium.
- Open vessel; separation visible.
- Quiet pool; no adverse turbulence.
- Quickly adjustable rake speed.

Complete HMS testing, plant designing and installation services.

The ORE & CHEMICAL CORP.

Division: Mining & Milling Machinery

80 BROAD ST., NEW YORK 4, N.Y

One of the nation's major sources of titanium, this open-pit has produced 15,000,000 tons of ilmenite-magnetite ore and 8,700,000 tons of concentrates since its start in 1942. Over 17,000,000 tons of rocky overburden have also been removed. Entire deposit is 1800 ft. long, 900 ft. wide; averages 35% magnetite, 32% ilmenite, 10% feldspar and 23% iron silicates. All ore and waste must be shot...drill holes are sunk with a 42-T churn drill using a 9 inch bit, to 39 ft. deep. From 350 to 500 lbs. of 90% gelatin dynamite are used per hole...each lb. breaks up 3½ tons of waste and ore. A 4-yd. shovel, together with four 22-ton rear-dump trucks, loads all waste ...two 2½-yd. shovels, together with seven 15-ton trucks, move the ore. Finished ilmenite goes to processing plants, for conversion into titanium dioxide pigments for paints, paper, rubber, ceramics, and other substances. Magnetite concentrate is both converted to sinter and shipped raw to various iron, steel, refractory, and cement plants.

How rubber-tired tractors cut costs for one of world's largest titanium mines

In the heart of the Adirondack Mountains in upper New York State lies a mine which is one of the world's largest producers of titanium. From a pit 900 ft. x 1,800 ft. comes 3,200,000 tons of ore and waste yearly. Two rubber-tired Tournatractors shuttle back and forth to handle tractor work at pit, stockpiles, and plant.

1 tractor cleans around 3 shovels, 1 dropball, 11 trucks

One of these 19 mph 208 hp units is assigned mainly to pit and dump clean-up. At the pit, it cleans around *two* 2½-yd. shovels, *seven* ore-hauling trucks, *one* 4-yd. shovel, *and* a rubber-tired dropball crane. At the dump, a mile away, it cleans up for a fleet of 4 end-dump trucks. Rig shuttles continuously between assignments. A 300 ft. trip between shovels takes as little as 20 seconds ...the mile from pit to dump takes 3 to 5 minutes. Despite this busy schedule, tractor finds time to move air compressors, drills, and other pieces of pit equipment.

Another dozes magnetite weighing 4800 lb./yd.

The second Tournatractor is used primarily on the magnetite stockpile. Here it dozes concentrate within range of clamshell that loads railroad cars, or else dozes directly into a hopper. Rig's blade often carries 2½ cubic yards of material — weight *6 tons!* When needed, this tractor moves to other stockpiles to doze ilmenite concentrate or coal. Occasionally, it spots railroad cars in the sintering plant area. As needed, it cleans spillage from roads and haulage ways, and does other odd jobs. Wherever it goes, rig's low-pressure tires do no damage to footing. They roll easily over pavement, railroad tracks and ties.

Each costs $1 less per hour to operate than crawler-tractors

On shovel clean-up jobs, owners report Tournatractors outproduce the biggest crawler-tractors, 2-to-1. Units usually work at higher speeds and move job-to-job at higher speeds. Tournatractors cost less to maintain, too...4 tires eliminate the headaches of 500 to 600 track parts. Lowered maintenance, plus lower repair and operating costs are proved by accurate figures kept by the mining company. These show cost to operate Tournatractor "averages" approximately *$1.00 less per hour than their records of average cost for crawler-tractors.*

You judge its advantages

Tournatractor's lower costs, "go-anywhere" mobility, and fast-working speeds can pay off for you, too! Ask your LeTourneau-Westinghouse Distributor for a demonstration of this versatile machine so you can judge its advantages for yourself!

Tournatractor—Trademark Reg. U.S. Pat. Off. T-752-M-bw

▼ Dozing stockpiled magnetite, Tournatractor moves up to 2½ bank yards (about 6 tons) per push.

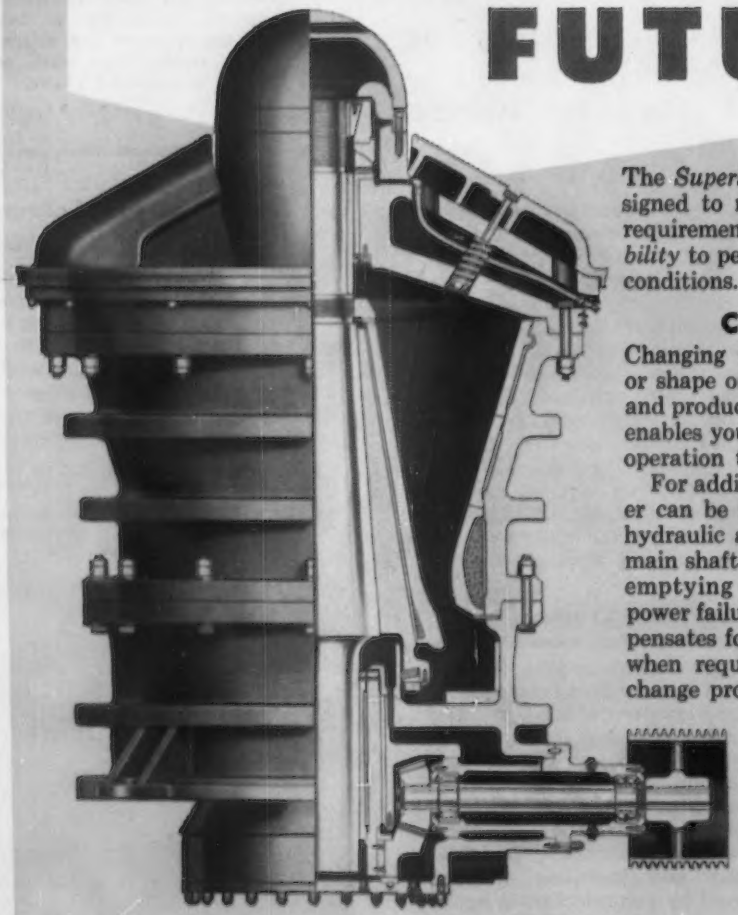
LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

SUPERIOR
Primary & Secondary
CRUSHER

Meets your needs TODAY and in the FUTURE!



The *Superior* crusher you install today is designed to meet your specific and immediate requirements — and it also has *built-in flexibility* to permit adaptation to future operating conditions.

Complete Adaptability

Changing the eccentric throw, crusher speed or shape of crushing chamber, varies capacity and product size. This high degree of flexibility enables you to obtain the best possible crusher operation to suit other plant equipment.

For additional flexibility, the *Superior* crusher can be fitted with *Hydroset* mechanism, a hydraulic arrangement for raising or lowering main shaft and mantle. This control facilitates emptying the crushing chamber in case of power failure or other emergencies. It also compensates for wear on concave and mantle and, when required, makes it possible for you to change product size instantly.

Write for Bulletin 07B7870

This 32-page bulletin describes the *Superior* crusher and gives you valuable crushing data. It's a book you'll want to have and keep. Ask your A-C representative for a copy or write Allis-Chalmers, Milwaukee 1, Wis.

A-4655

Superior and *Hydroset* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

400-Car repeat order in 1954 tells better than any other words how the user's original 340 cars performed since 1941. All 740 cars, bought from ACF Industries, Inc., were built of COR-TEN Steel, a high strength, low alloy steel containing nickel.

Put your money in cars like these

...still good after 13 years' continuous use

THE FOLLOWING EXAMPLE is typical:

A West Virginia mining company bought 340 mine cars built of high strength, low alloy steel containing nickel . . . produced by United States Steel Corporation under the trade name of COR-TEN steel. After 13 years of resisting corrosion and battering, these 5-ton cars still remained in good operating condition.

Impressed by this performance, the mining company ordered 400 more cars last year. Naturally, COR-TEN steel was again specified.

High strength, low alloy steels of this type have a 50% higher yield point than does structural carbon steel. Plus definitely greater resistance to impact, wear, fatigue and abrasion. Moreover, the nickel steels retain much of their original strength during years of use, because they offer five times as much resistance to atmospheric corrosion.

This means not only less maintenance, but greatly increased life for equipment made of high strength, low alloy steels containing nickel. So get all the facts . . . send for a copy of "Nickel-Copper High-Strength Low Alloy Steels."

It tells you why these nickel steels offer superior resistance to atmospheric and many other types of corrosion . . . how they act in sub-zero temperatures . . . their response to fabrication. It describes design factors that can help you cut deadweight. Write for your copy now and learn how these steels can save you money.

INCO **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N.Y.

SYMONS®

CRUSHERS and SCREENS

have been serving CLIMAX MOLYBDENUM COMPANY for over 25 years

This Nordberg Machinery dependably serves CLIMAX in its expanding production of molybdenum

- 60-IN. SYMONS PRIMARY GYRATORY CRUSHER
- TWELVE 7-FT. SYMONS CONE CRUSHERS
- TWENTY-FIVE SYMONS ROD DECK SCREENS

High up in the Rockies in Colorado is the miracle mine of modern times. Its immensity marks an achievement unequalled in the industry and its glamour parallels to a marked degree the romance which has woven its way through mining history. Here, two and one-third miles above the level of the sea is located Climax Molybdenum Company . . . presently the largest underground mining operation in North America and the largest producer of molybdenum in the world.

As the percentage of pure molybdenum present in molybdenite ore is generally low and as it is usually found disseminated through hard, crystalline rocks, the importance of a successful method of reduction crushing can be appreciated. *As early as 1927,* Climax recognized the inherent advantages of Symons Cone Crushers. Later, after extensive testing of all types of screens, Climax standardized on the Symons Rod Deck.

Today, the greatly expanded Climax production depends to a large degree on Nordberg Machinery . . . a 60-inch Symons Primary Gyratory Crusher . . . TWELVE 7-ft. Heavy Duty Symons Cone Crushers . . . and TWENTY-FIVE Symons Vibrating Rod Deck Screens.

For at CLIMAX . . . *as in all of the great ore and industrial mineral operations the world over* . . . NORDBERG MACHINERY is the outstanding preference among leading producers for processing great quantities of finely crushed and screened product at low cost.

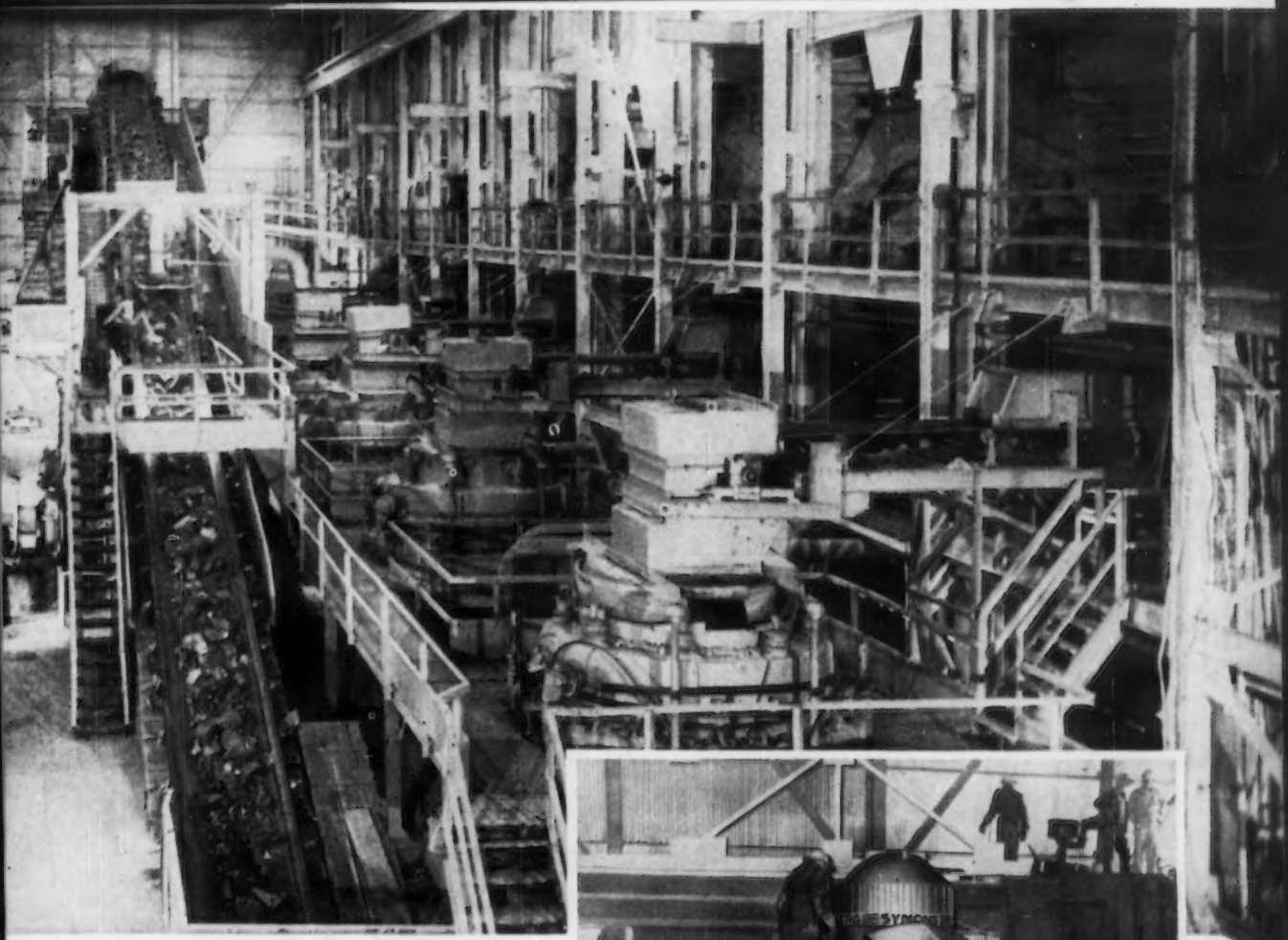
Write for further information on the machinery *you* need for the profitable reduction of ores and minerals.

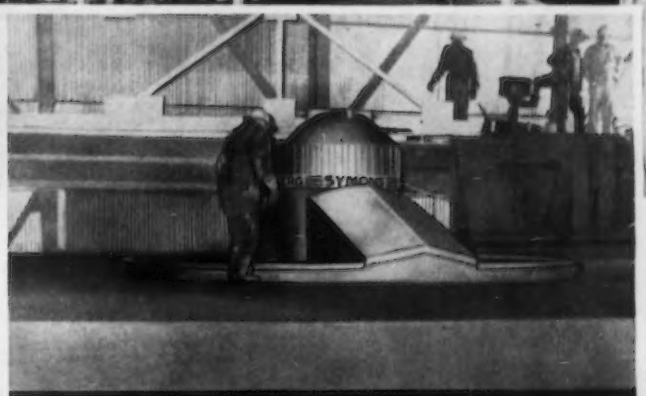
Record of Symons Crusher and Screen Installations at Climax:

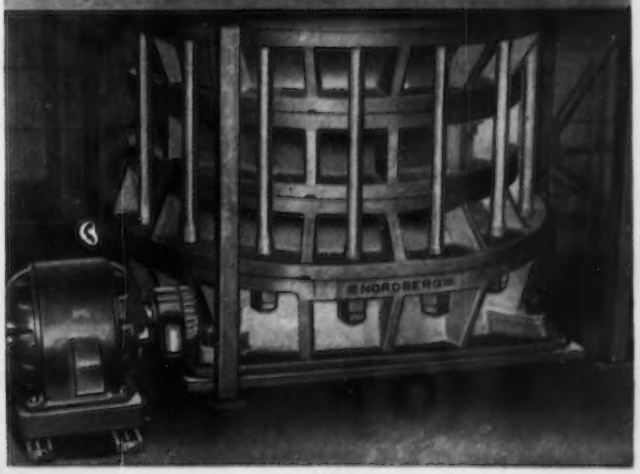
SYMONS CRUSHERS

1927—1 4′ Standard	1953—1 7′ Short Head
1930—1 5½′ and	1 60″ Primary Gyratory
1 7′ Standard	
1933—3 5½′ Standards	
1935—2 7′ Short Heads	**SYMONS SCREENS**
1936—2 7′ Standards	1941—6 Rod Decks
3 7′ Short Heads	1942—5 Rod Decks
1937—2 7′ Short Heads	1943—7 Rod Decks
1952—1 7′ Short Head	1953—5 Rod Decks

NORDBERG MFG. CO., Milwaukee, Wisconsin







Above: **Five of the 12 Symons 7-ft. Heavy Duty Cone Crushers installed at Climax.**

Right: **60-in. Symons Gyratory Crusher used for primary breaking at the new Storke Level plant at Climax.**

Below: **Two of the 25 Symons Vibrating Rod Deck Screens installed at Climax.**

C655

© 1955, Nordberg Mfg. Co.

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

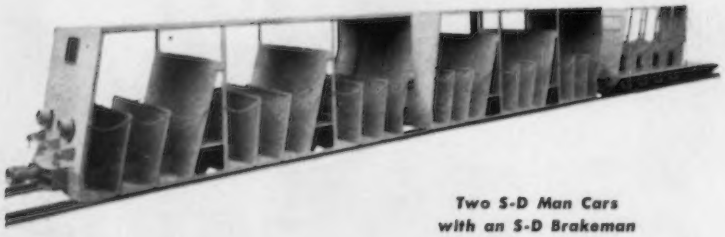
NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
TORONTO • MEXICO, D.F. • LONDON • JOHANNESBURG

SYMONS...

A REGISTERED NORDBERG TRADEMARK

KNOWN THROUGHOUT THE WORLD

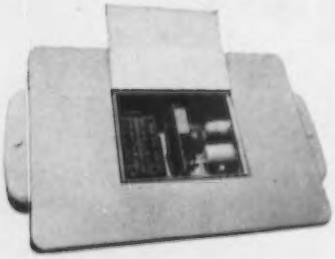
An S-D Granby

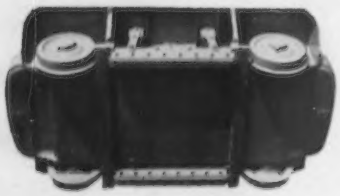


Two S-D Man Cars
with an S-D Brakeman

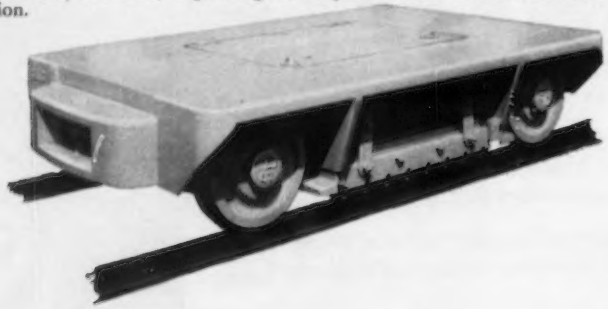
Sanford-Day... Super

Now you can eliminate skids and additional locomotives for braking trips downgrade!

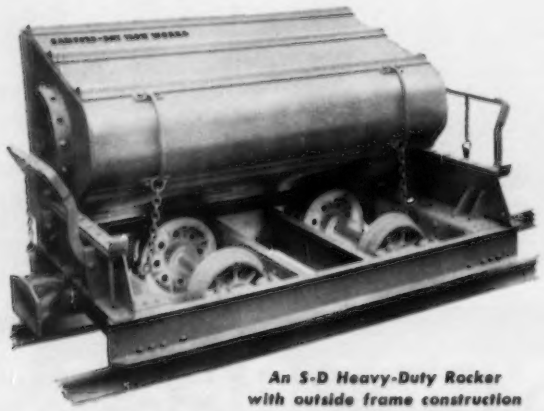




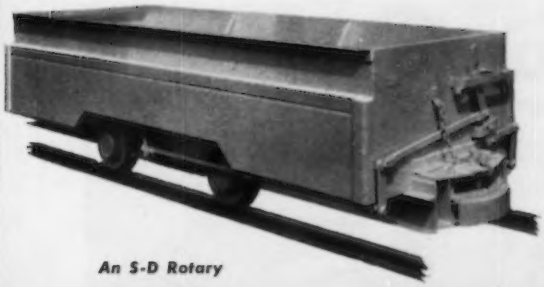
YOU NEED NO LONGER resort to skids or costly locomotives for extra braking power. We have developed a special car for braking that incorporates electrically operated magnetic brake shoes. Several are already on the job in metal mines. The S-D Brakeman Car is built to meet your particular requirements. It may be used between locomotives . . . between locomotive and cars . . . between cars or at end of a trip to prevent runaways due to coupler failures, etc. Controls can be provided at locomotive operator's fingertips. Top photo at left shows the compartment for batteries and motor-generator set. Lower photo shows the pair of brake shoes. One or several pair may be used, depending on requirements. Ask us for more information.



An
S-D
Rocker



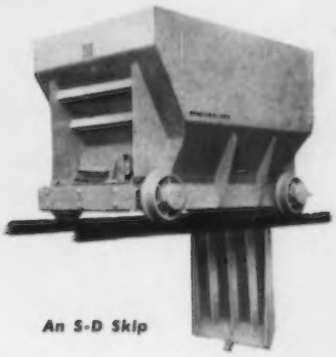
An S-D Heavy-Duty Rocker
with outside frame construction



An S-D Rotary

An S-D Gable Bottom

Market for mine cars



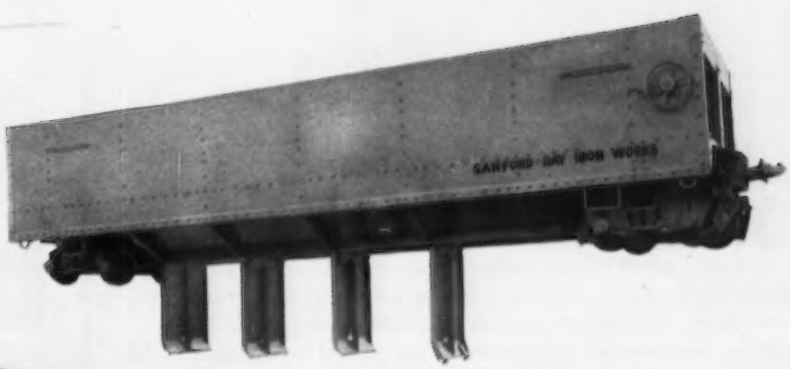
An S-D Skip

IS THERE SOMETHING SPECIAL you need in mine cars—a feature to meet your particular requirements? You probably will find the answer in our plant. Down through more than 50 years of car building experience we have solved the major problems of mine haulage.

Regardless of the type car you need, we build it . . . cars so constructed to give you more years of service with the least maintenance. Shown here are but a few of scores of all types S-D Mine Cars regularly being built for metal and non-metallic mines. All are designed and constructed to give superior service for the lowest dollar. Whether you need one car or 101, don't hesitate to get one of our engineers into your mine—face-to-face with your problem. With this type of cooperation, plus our facilities and capacity to build any type mine car of any size, any haulage problem in your mine can be solved. *SANFORD-DAY IRON WORKS, Telephone 3-4191, P. O. Box 1511, Knoxville, Tenn.*

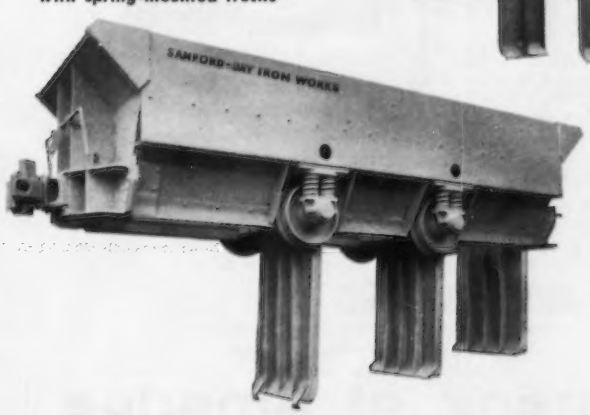
An S-D Automatic

● ASK US ABOUT THE S-D GISMO . . . the self-loading transport that promises big new economies in mining. It merits thorough investigation by any firm excavating rock or its equivalent.



An 8-wheel S-D Automatic

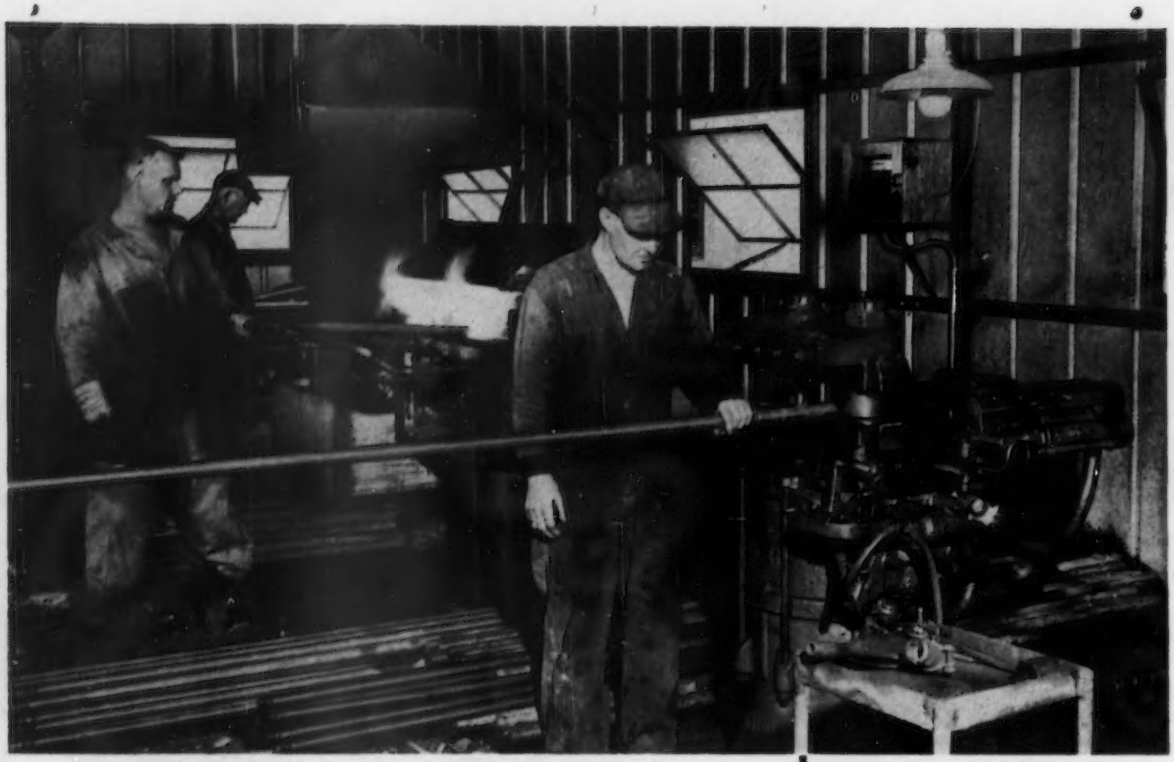
An S-D Automatic with spring-mounted trucks



Sanford-Day IRON WORKS
KNOXVILLE • TENNESSEE

AND BROWN-FAYRO DIVISION

MINE CARS, All Types • PRECISION WHEELS • "Brownie" HOISTS
CAR RETARDERS • SPOTTERS
PUMPS • OIL SPRAY SYSTEMS



Blacksmith Billy Watkins shanking a Crucible Hollow Drill Rod.

they're using Crucible Hollow Drill Rods on the Boston Tunnel Jobs . . .

400-feet below the city of Boston, two seven-mile tunnels are being cut through solid rock. Replacing century-old mains, the tunnels will bring water from Quabbin Reservoir, 70 miles away, and remove drainage from the city.

On this job, like most other tough ones, Crucible Hollow Drill Rods are in daily use. For experienced construction men *know* they can depend upon Crucible Hollow Drill Rods for top performance at *lowest cost per foot of hole drilled.*

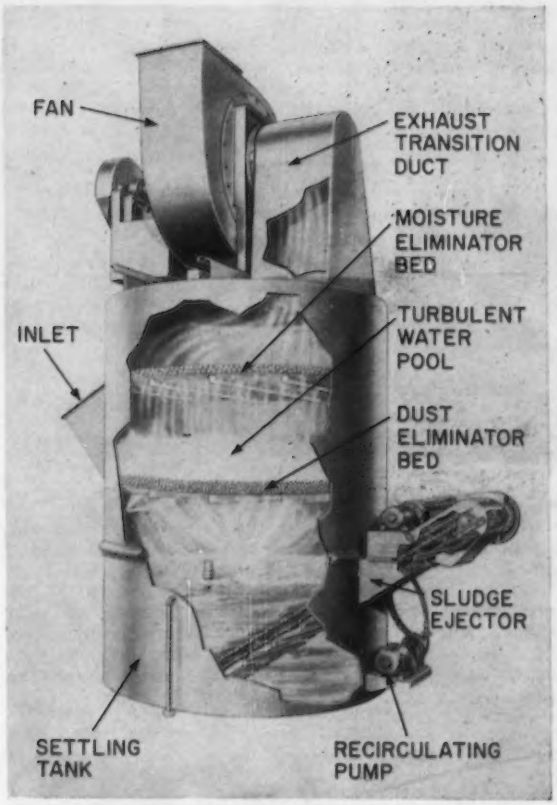
That's because they are made to *tool steel* standards by the nation's leading producer of *special steels.* So for *extra* dependability on *all* your drilling jobs specify Crucible Hollow Drill Rods. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

120-foot-high head frame used to raise and lower men and materials in excavation shaft. Morrison-Knudsen-Kiewit-Maney City Tunnel Extension Job, Boston, Mass.

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

E&MJ NEW PRODUCTS DIGEST



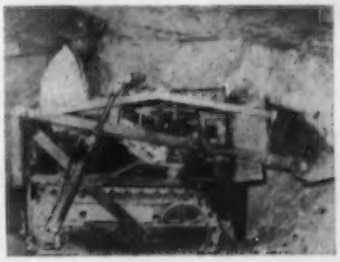
Dust Collector

"HYDRO-FILTER" IS A WET-TYPE DUST COLLECTOR operating on the filtration principle using glass spheres as a media. The maker, National Dust Collector Corp., Chicago, Ill., claims it has exceptionally high collection efficiency even over a wide range of velocity and load, is continuously self-cleaning, needs little maintenance and requires little water.

Basically, the unit is an air scrubber. Dust laden air is brought into contact with water under conditions which cause the dust to transfer to the liquid stream. It operates on the principle of filtration through packed media—in this case, glass spheres. Flow of water, reverse to that of air, cleans media continuously. Initial cost is equivalent to most wet-type collectors. Operating cost said to be less than comparable size units. Entering air impinges on settling tank water, rises through water shower and lower bed into turbulent water pool, and leaves through upper bed and out duct. **(1)**

Tractor-Loader

"AGRICAT" LINE OF TRACTOR-LOADERS has addition that brings trackless mining to small mine says Earl H. Pence & Co., Inc., San Leandro, Calif. Powered by diesel engine with chemical scrubber, unit has hydraulic-operated 5 cu ft scoop and is meant for use with shuttle buggies. It is 88 in. long, 43 in. high and 50 in. wide with bucket on; travels up to 4 mph; and can load 1-yd buggy in 4 to 5 minutes says maker. Low maintenance is claimed. **(2)**

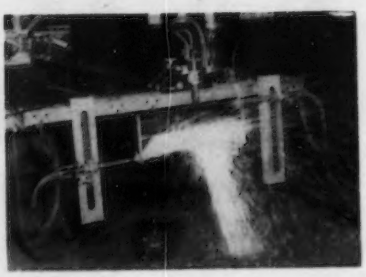


BRUSH CUTTER (33)

Attachment for Model 17 chain saw. Maker, Homelite Corp., Port Chester, N. Y., claims it speeds up job four times. Ruggedness, lightweight emphasized. Shoulder harness carries weight. Scythe-like swing used. Ten-inch blade on 5 ft arm usable in any position.

AC MOTOR (34)

Adjustable speed without dc convertors, transmissions, et al. Named N-S Variable Speed ac motor. Manufacturer, Bogue Electric Mfg. Co., Paterson, N. J. Adapted to high starting loads. For ½ to 1000 hp. Speed variation range 1.5:1 to 30:1. Automatic or manual controls.



METAL SAW (35)

"Flame Saw." Low cost, hand portable. Automatic. Uses 110 v. Oxygen-fuel-gas flame. For heavy structurals. No bench needed. Said to be noiseless, fast, accurate. Attachments for extra long or circular cuts. K-G Equipment Co., Allentown, Pa.

MOLDS (36)

Glasscast process for precision metal casting. Corning Glass Works, Corning, N. Y. High silica glass and water mix makes slip, poured in plaster form, dried, removed, fired. Good dimensional stability, no cracking or spalling. For high temperatures.

DRAFTING INSTRUMENT (37)

To translate orthographic drawings into perspective accurately or vice versa in the case of photographs, the Perspectograph Corp., New York, N. Y., offers a pantograph-like device. Instrument fastens to drawing board with thumb tacks. It is said to require only a minimum of skill. It operates on principle of cylindrical panorama perspective.

PIPE WRENCH (38)

"Red Snapper" is new style pipe wrench offered by Stilsomatic Sales Corp., Washington, D. C. Four unique features listed in release are: tubular steel construction, automatic adjusting by rocking fulcrum action, spring loaded hook jaw, and lightweight. The rocking fulcrum action allows several fits at same setting. Spring jaw holds wrench in place.

DRILL RIG (39)

"Drill Scout" can be used trailer mounted or on truck. Lifting capacity is enough for 200-ft holes. Weight is under 1000 lb. Speed is variable from 250 to 500 rpm. Kelly bar has 6-ft travel. Drill stems are 5 ft. One man operated, rig is made by Gustafson Mfg. Co., Inc., Corpus Christi, Tex., and is powered by either 6 or 9 hp Clinton engine.

CABLE CLAMPS (40)

Reinforced plastic cable clamps are being marketed by Lunn Laminates Inc., Huntington Station, N. Y. The clamps of resin-bonded glass fiber are claimed non-corrosive, strong, fire resistant, insulating and ideal for application where shock and vibration are important factors. They are available for cable diameters from ⅛ to 2 in. They were developed for aircraft industry.

QUENCHING OIL (41)

Fast cooling rate of Voluta Oil 23 aids quench hardening according to Shell Oil Co., New York, N. Y. Now, it is stated, low carbon or alloy steels can be oil-quenched where formerly water was needed, and step quenching can be replaced by one operation. The company says oil cools fast enough to produce desired structure yet slow enough to prevent distortion and cracking.

FLASHLIGHT (42)

To prevent fire or explosion, automatic circuit cutoff is provided by plastic reflector assembly in line of flashlights offered by Eveready, according to Auburn Button Works Inc., Auburn, N. Y. USBM has approved assembly for use in methane-and-air mix and UL approval has been given for a number of other hazardous atmospheres. Spring opens contact if bulb is broken.

WELDING ALLOY FLUX (43)

Low alloy steels are arc-welded better with their new line of alloy fluxes, according to Lincoln Electric Co., Cleveland, Ohio. The special fluxes, through a special process of agglomeration, contain alloying elements which may be precisely varied to fit job. Mild steel electrode is used. It is claimed as a new approach to welding complex special steels.

OWNERS REPORT THE DECISIVE DIFFERENCE IN NEW

TD-18A Performance

"It can self-load and deliver fastest" "International TD-18A improvements like the new 300% stronger track frames and cartridge-type roller seals increase production, machine life, and operating ease. As for power, our new TD-18A can self-load the 8-11 cubic yard scraper and deliver fastest of any crawler we ever had." *Here's proof extra traction matches the TD-18's power increase!* G. W. Owen, McDonough, Ga.

"Every load's a payload" "My TD-18A International Drott is built for the operator's comfort. I know, because I'm the operator. It has 360° visibility which no other loader has. Every load is a payload." *No other outfit built gives you the TD-18's combination of power, visibility and responsive controls.* V. S. Steffes, Owner, Earthmoving and Clearing, Batavia, Illinois.

"Operators fight for new TD-18A!" "The TD-18A's were always good—fast, trouble-free performance and low operating cost made me money. The new model TD-18A is stronger and really planned for the man in the seat. It has operators fighting for it." Big, wide, comfortable cushions; hydraulic steering control boosters, and levers, conveniently grouped on the roomy, non-skid deck! *No wonder TD-18A handling ease turns "skinners" into high-producing operators through-out the day!* M. B. McKee, McKee Construction Co., Chickasha, Oklahoma.

"Uranium search toughest of all!" "I'm in the hardest work I know of—building roads into uranium claims, rim-cutting development work. The TD-18 we used for six years had the motor overhauled after five years, and when we traded a year later the transmission and drives were still original equipment. I believe this heavied-up new model TD-18A is by far the best of all." *Advances like the new bridge-strong welded track frames, stronger transmission and exclusive cartridge-type track roller seals back his judgment.* O. Frost Black, Owner, Blanding, Utah.

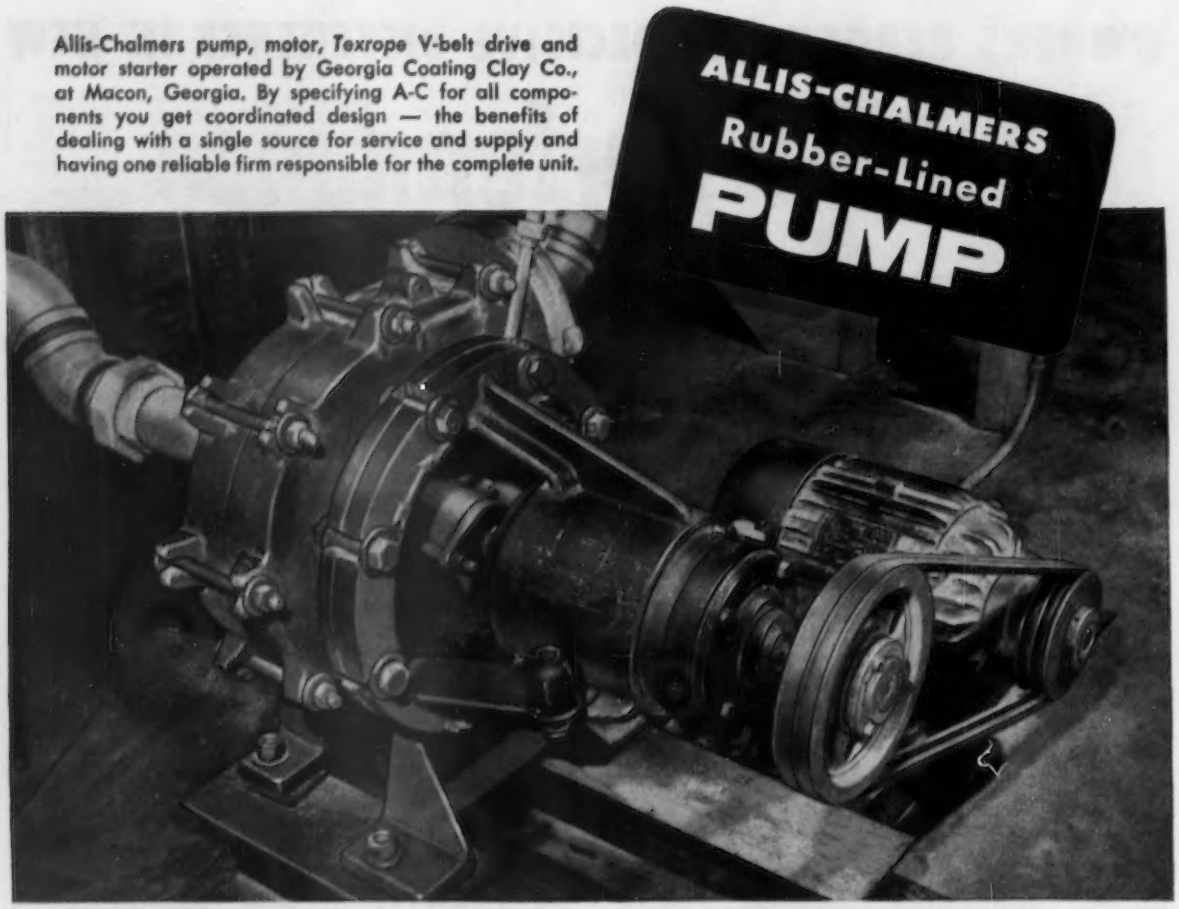
Ease into the foam-rubber-padded, panoramic-vision seat and see the *decisive difference*. Try new finger-tip power steering, and other big *job-easing incentives* for boosting production, as developed only by International. Prove TD-18A *full-power traction*—note, too, how the gear train is beefed-up to transmit 103 drawbar hp, and then some! Measure what new *300% stronger track frames* mean *for full-capacity performance* under slam-bang conditions. Compare how new *cartridge-type track roller seals*, and other International *downtime-prevention engineering*, beat anything else on tracks. Ask for a new TD-18A demonstration!

INTERNATIONAL HARVESTER

INTERNATIONAL
INDUSTRIAL POWER

MAKES EVERY LOAD A PAYLOAD

Allis-Chalmers pump, motor, *Texrope* V-belt drive and motor starter operated by Georgia Coating Clay Co., at Macon, Georgia. By specifying A-C for all components you get coordinated design — the benefits of dealing with a single source for service and supply and having one reliable firm responsible for the complete unit.



In 7 months' continuous duty...
NO MAINTENANCE

Georgia Coating Clay Co. uses A-C Rubber-Lined Pump to move highly abrasive clay slurry

SINCE ITS INSTALLATION IN MARCH, 1954, this Allis-Chalmers Rubber-Lined Pump has been operating "round the clock," handling 17% to 36% clay slurry with pH ranging from 5.0 to 7.0. The previous pump required impeller replacement about every six weeks.

Long Life, Lasting High Efficiency

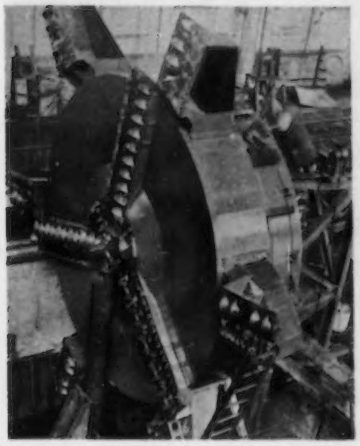
With Allis-Chalmers Rubber-Lined Pumps you can make adjustment to maintain proper clearances between the impeller and the casing. This adjustment — which prolongs pump life and efficiency — is merely a matter of resetting adjusting screws. Owners report A-C Rubber-Lined Pumps last from 10 to 50 times as long as hard alloy pumps.

GET ALL THE FACTS . . .

Find out how these new pumps help you maintain high output, cut maintenance, service and down-time costs. See your representative or write Allis-Chalmers, Milwaukee 1, Wis. Ask for Bulletin 52B8156. A-4543

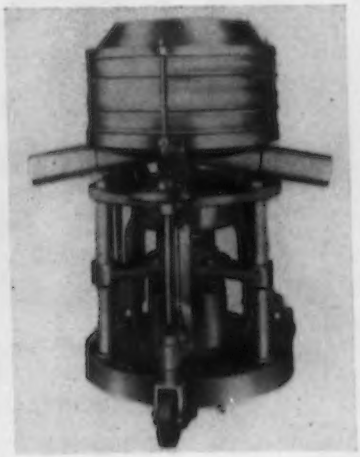
Texrope is an Allis-Chalmers trademark.

ALLIS-CHALMERS



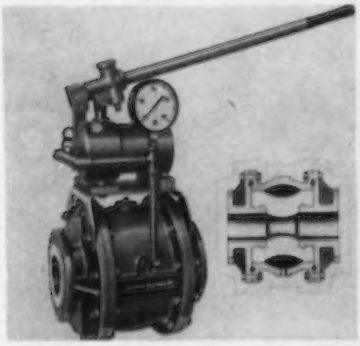
TUNNEL BORER (44)

Goodman Mfg. Co., Chicago, Ill., announce custom built machines for tunnel boring without explosives. Six outer cutting elements rotate opposite to three inner ones. Each element contains a row of fixed cutters which gouge out thin annular groove and a row of rolling disks which crush residual ridge by pressure at center of ridge. Buckets on outer element scoop up muck, discharge at top.



GYRATORY SCREEN (45)

Much larger throughput than a shaker screen of same area is claim made by Russel Constructions Ltd., London, England, for their Cascade dry sieving machine. A vertical series of circular screens are gyrated so that particles follow spiral path down through unit. The horizontal circular movement is particularly useful for taking out fines which have one longer dimension, it is said.



PINCH VALVE (46)

Hydraulic pressure supports as well as controls massive rubber constrictive section in Krebs slurry valve from Equipment Engineers Inc., San Francisco, Calif. Rupture and abrasive protection, positive closure on grit, center orifice flow and easy operation—frequently deficient conditions on ordinary pinch valves—are claimed to be effected.

AERIAL TOWER (47)

"Hi-Ranger" extensible folding towers for mobile mounting make high mine roofs readily accessible. Mobile Aerial Towers Inc., Ft. Wayne, Ind., offers a number of sizes of the hydraulically operated units which can be maneuvered by single three-dimensional control handle on self-leveling two-man platform. Hydraulic outriggers give stability.

CHUTE LINER (48)

Metal backed rubber chute lining that can be used as a basic construction material and can be installed on existing or new structures has been placed on the market by Goodyear Tire & Rubber Co., Akron, Ohio. The abrasive resistant rubber bonded to hot rolled steel is called "Armaplate." It can be formed, sawed, and sheared like sheet steel, and bolted or tack welded.

CONDUCTIVE LUBRICANT (49)

Conducto-Lube Co., Portland, Ore., offers a highly conductive lubricant designed for use in conducting hinge joint switches. It is claimed ideal for high speed air blast breakers where a lubricant is essential. And it can be used on knife blade switches to prevent their "balling up" and "freezing." The high conductivity will reduce resistance and heating in any switch.

Super Scale
for
Conveyors
Builders Conveyoflo is unsurpassed for accurate weight-metering of belt conveyor flows. Pneumatic system gives full-range metering with minimum vertical belt deflexion. Compact — no overhead framework or complicated lever arms. For Bulletin 550-H4A, write Builders-Providence, Inc., 391 Harris Avenue, Providence 1, Rhode Island.
BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC.
METERS
FEEDERS
CONTROLS

EARTH AUGER (50)

Powered by a rear power take off from a light truck, the earth auger made by H. S. Watson Co., Emeryville, Calif., can be run by one man. It operates any place within a 4x8-ft area without moving truck. It drills at any angle.

LOADER ATTACHMENT (51)

Low overhead clearance makes "Excaloder" attachment useful underground. Made by Link-Belt Speeder Corp., Cedar Rapids, Iowa, it adapts their LS-98 1-yd shovel-crane to straight-line loading. Other attachments can be interchanged.

PROTECTIVE COATING (52)

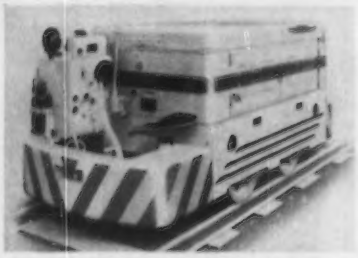
"Amercoat No. 87" cuts application time and labor 50% by eliminating the need for multiple coats, according to Amercoat Corp., South Gate, Calif. They say it can be sprayed on 10 mils thick and will not flow away from edges or sharp corners. With the impermeability of vinyl and the thickness of mastic, it is claimed to have high chemical, electrical and abrasion resistant qualities.

METAL-BACKED PAPER (53)

Drawing sheets sold by Geo-Optic Co., New York, N. Y., consist of thin aluminum sheets covered on both sides with paper. Dimensional stability is advantageous especially for mapping. It comes in several gages of metal and weights of drawing paper. Photographic sheets are also available. One type of sheet is designed for plane table work, another is flexible to permit rolling.

SAW BLADE (54)

Electrolytically saturated with chromium, "Tuff-Tooth" circular saw blades last at least four times as long between sharpening as with high grade, non-toughened ones, say Prize & Rutzebeck, Hayward, Calif. The blades are offered on that basis with money back guarantee. Faster cutting and cooler running are claimed as well as longer cutting life. Only outer ½ to 1 in. is chromed.

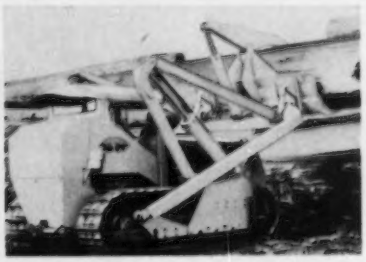


DIESEL LOCOMOTIVE (55)

"Mine-O-Motive" series by Fate-Root-Heath Co., Plymouth, Ohio, covers 5 to 10-ton, diesel powered mine locomotives. Eventually it will include 2-ton trammer. One model has been approved as "permissible" for coal mines by USBM. Exhaust scrubbers are offered on all models. Also offered is torque convertor. Other series include 3 to 70-ton gasoline, diesel, or diesel-electric models.

TRUCK TRACKS (56)

Wherever dual wheeled equipment must move over mud, snow or sand, increased flotation is gained by use of truck tracks available from P&G Supply Co., Portland, Ore. They are adjustable to various size tires, are easy to mount and give up to 500% greater flotation. Routine equipment in armed forces, they are being widely adopted by other truckers according to the company's release.



GRASP LOADER (57)

For loading logs, large-diameter pipe and similar material, the Austin Div., Central Ohio Steel Products Co., Galion, Ohio, has developed a hydraulicly operated attachment for their overshot loader. It consists of a bulldozer blade on which is mounted a large steel hook actuated by a double acting hydraulic cylinder. Blade can be used for normal bulldozing work.

FILTER FELT (58)

Made of tightly compacted, resin-bonded Dynel synthetic fibers, "Feon" is a highly chemical resistant filter media. Principal application of the felt made by Filtration Engineers Inc., Newark, N.J., is for pressure filters and centrifuges. It is easy to clean, will not shrink and has high strength. Structure retains fine solids yet has relatively high porosity for high filtering rates.

STAINLESS COATING (59)

Diffusion of chromium into ferrous metals to form a stainless surface alloy 0.001 to 0.008 in. deep is a process recently developed by Alloy Surfaces Co., Philadelphia, Pa. Claims are: cost is less than for stainless steel fabrication; no dimensional changes are caused; surface will not chip, peel or crack; objects can be brazed or welded before or after processing. Castings can be treated.

DIESEL ENGINE (60)

For the medium size truck—19,500 to 26,000—Cummins Engine Co. Inc., Columbus, Ind., has announced production of a lightweight, 175 hp Turbodiesel called the JT 6. Its weight, 1615 lb or 9.2 lb per hp, is comparable to gasoline engines of similar power. The normally wasted energy of exhaust gas is used to drive a turbine supercharger. It is a six cylinder in-line type displacing 401 cu in.

Diamond Setting Department. Skilled operatives "orient" selected diamonds, in predetermined positions, in the bit molds, so that the hardest rib or "vector" of each stone is set toward the work.

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ORIENTING EACH DIAMOND in a bit mold, on a commercial basis, is an outstanding achievement; accomplished by aid of special equipment and intensive training; after impartial comparative tests, conducted in cooperation with the U. S. Bureau of Mines, had PROVED that Oriented Diamond Bits cut much faster and last much longer than similar bits in which the stones are set at random.

Since standardizing on Oriented Diamond Bits, we have produced THOUSANDS, in a wide variety of types and sizes, with both cast and powdered-metal matrices, to meet every diamond drilling requirement, AT NO ADVANCE IN COST TO THE PURCHASER.

A corner in one of our machine shops. Diamond Bits and other diamond drilling accessories are machined, efficiently and accurately on modern turret lathes.

For either core drilling, or any other kind of diamond drilling, we believe these to be the most efficient and economical diamond bits ever produced and invite inquiries on that basis. Bulletin No. 320 illustrates and describes all types and gives complete working data. Write for a free copy and tell us about your drilling conditions. Our experienced executives welcome opportunities to make money-saving recommendations regarding the best type of matrix and most suitable grade of diamonds for any particular job.

After the bits have been set and accurately machined, they are heat-treated in these modern temperature-controlled furnaces, to assure proper hardness for type of matrix used.

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Model RB94P STOPERS **Model SFH99 DEEPHOLE DRILLS**
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Write for further information on the complete line of Gardner-Denver rock drills, deep hole percussion drilling equipment, and other mining equipment.

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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

E&MJ NEW PRODUCTS DIGEST

ELECTRICAL VARNISH (61)

SR-60, silicone varnish ,made by General Electric Co., Pittsfield, Mass., is reputed to possess greatly improved physical properties at temperatures up to 250 deg C. Low viscosity gives good penetration. It cures rapidly at lower temperature and has better bonding strength and over-all toughness. Electrical properties remain more than adequate.

GALVANIZING PATCHER (63)

Metal alloy stick called ReGalv is available from RotoMetals, San Francisco, Calif., for repairing any area where zinc coating has been damaged or destroyed. Merely rubbed over weld or other hot surface to be recoated, it melts and bonds as low as 600 deg F. No flux or pretreatment other than brushing off scale is needed. It is also claimed to outlast original coating.

WELL CASING CUTTER (62)

Fluorine chemicals are used to make a clean cut in a new well casing cutting tool developed by McCullough Tool Co., Houston, Texas, and Pennsylvania Salt Mfg. Co., Philadelphia, Pa. Cylinder with ring of orifices is lowered into well. Electrical means causes chemical to be ejected at enormous pressure. Cut is made in fraction of second.

RUBBER TIRE (64)

U. S. Royal Mine Cushion, demountable solid rubber tire for mine shuttle cars, is said to double tire life, allow higher speed and eliminate unexpected tire failures. Easier rolling than pneumatic tires of same size at same load, they come in three sizes to replace the six pneumatic sizes. Smaller outside diameter reduces car height as well. U. S. Rubber Co., New York, N. Y., makes them.

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

STEEL BELT CONVEYORS made by Sandvik Steel Inc., Fairlawn, N. J., are very thoroughly and interestingly presented in a 48-page hard cover book which gives engineering and application information. **(66)**

LIFT TRUCK selection guide is available from Hyster Co., Portland, Ore. Check list chart lists 36 features to be compared. Final determination is based on cost per point of rating given by prospective user. **(67)**

PACKAGED TIMBER handling at Hecla Mining Co. operations, is reported in a brochure, available from Hyster Co., Portland, Ore. Fork lifts are used to move loads. **(68)**

TOOLROOM HEAT TREATING department planning is described in a 24-page booklet from the Furnace Div., Lindberg Engineering Co., Chicago, Ill. Selection and layout is given. **(69)**

PROGRAM CONTROL of Process Variables is the title of a 22-page booklet done in the usual fine manner by Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. Well organized and simply and clearly presented, it describes the use of automatic controls to carry out an industrial process according to a predetermined time and conditions schedule. **(70)**

STEEL BUYER'S GUIDE is 84-page brochure giving quick information on specifications of steel itself, on specifications for cutting to user's needs, and on method to save money by combining orders for bars, structurals, plates, sheets and strip. It was prepared by Joseph T. Ryerson & Son, Inc., Chicago, Ill., for use by actual purchasers. **(71)**

CORROSION CONTROL with zinc is covered in a 32-page illustrated booklet issued by American Zinc Institute, New York, N. Y. Metallic coatings, pigments and anodes are described and applications of each are reviewed. **(72)**

PUBLICATION LIST of Allegheny Ludlum Steel Corp., Pittsburgh, Pa., is available. Listed in the 16-page pocket size catalog are all of the company's technical data sheets and booklets. Brief descriptions are given for each listing. **(73)**

RADIATION COUNTERS for prospecting, both geiger and scintillation, from Neuclear Measurements Corp., Indianapolis, Ind., are described and illustrated in an 8-page catalog. Counters can be serviced without tools. **(74)**

AIR-LINE LUBRICATORS made by Ingersoll-Rand Co., Phillipsburg, N. J., are specified in 8-page bulletin. How they work and how to select the right model is shown. Requirements for rock drill lubricants are also given. **(75)**

SPECIAL CONVEYOR BELT CONSTRUCTIONS available from B. F. Goodrich Co., Akron, Ohio, are shown

SEPT. 1955

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8	22	36	50	64	78	92
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14	28	42	56	70	84	98

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E&MJ NEW PRODUCTS DIGEST

PRODUCTS AND FACILITIES of Jeffrey Manufacturing Co., Columbus, Ohio, are concisely presented in a booklet just issued. More detailed catalogs can be ordered. **(77)**

WELDING EQUIPMENT for inert-gas-shielded metal arc welding is featured in a 16-page catalog from Air Reduction Sales Co., New York, N. Y. Called Aircomatic, the units are manual and automatic. Accessory apparatus is shown, illustrated and explained for welding all metals without flux. **(78)**

LUBRICATED PLUG VALVES is title of 28-page catalog from Homestead Valve Mfg. Co., Coraopolis, Pa. Straightway and multiport valves for 250 lb oil-water-gas and 150 lb steam working pressure are shown. Wide choice of metals, port shapes and sizes are offered. Method of specifying is shown. **(79)**

ROLLING BEARINGS, a 52-page catalog-bulletin published by Dodge Mfg. Corp., Mishawaka, Ind., features the new SCM line of ball bearing pillow blocks and flange cartridge mounts. But it also contains complete technical data on the whole line of Dodge SC ball and Dodge-Timken roller bearings. **(80)**

V-BELTS for every type of V-drive are cataloged in 23-page booklet from Maurey Mfg. Corp., Chicago, Ill. Data is very thoroughly and attractively presented. Selecting the right drive is discussed and maintenance pointers are given. Fastening or splicing is also explained. **(81)**

LIQUID METERS made by Buffalo Meter Co., Buffalo, N. Y., and trademarked Niagara, are covered in a catalog just off the press. The latest refinements in chemical meters as well as standard types are shown. **(82)**

SAFETY AIDS available from National Safety Council, Chicago, Ill., are described in 68-page Occupational Safety Services Guide for 1955. From worker to boss, safety can be driven home with these aids. **(83)**

PHOTO-INTERPRETATION instruments made by Abrams Instrument Corp., Lansing, Mich., and called the explorer team, are illustrated, described and priced in a one page release. **(84)**

SCINTILLATION SYSTEM, model ds-7, for aerial and ground radioactivity exploration is described in 8-page folder from Nuclear Instrument and Chemical Corp., Chicago. **(85)**

COAL RECOVERY DRILLS are featured in a 4-page bulletin published by Salem Tool Co., Salem, Ohio. Field operation pictures and model specifications describe horizontal power feed drills using 6-ft-long augers from 16 in. to 42 in. in diameter. **(86)**

VERTICAL AUGER DRILLS for strip mine operation, highway construction, and exploration are described in 4-page bulletin from Salem Tool Co., Salem, Ohio. The auger flights come 6 ft long up to 24 in. in diameter. **(87)**

MINING MACHINE BITS known as "G" and "H" series made by Carmet Div., Allegheny Ludlum Steel Corp., Pittsburgh, Pa., are described in folder. **(88)**

ROAD GRADER model 5D-190, 195 hp giant, is covered in 12-page bulletin issued by Huber-Warco Co., Marion, Ohio. Action photos are featured. **(89)**

PAN TYPE CONVEYORS, balanced type as well as conventional, manufactured by Simplicity Engineering Co., Durand, Mich., are shown in brochure. **(90)**

UNIT FLOTATION CELL of Denver Equipment Co.'s "Sub-A" line is described in pamphlet from the Denver, Colo., company. Applications are shown. **(91)**

WASHING PLANT 405-W fabricated by Pioneer Engineering Works Inc., Minneapolis, Minn., is "kingsize." Details are in 8-page bulletin. **(92)**

WASHING SCREENS using a series of small pools to do a better job, are explained in bulletin from Allis-Chalmers Mfg. Co., Milwaukee. **(93)**

DIAPHRAGM PUMPS with adjustable stroke and for heavy duty are detailed in a booklet issued by Denver Equipment Co., Denver, Colo. **(94)**

FLEXIBLE COUPLINGS, where to use and how to specify, is subject of folder from Smith & Serrell Inc., Newark, N. J., makers of Flexpin couplings. **(95)**

THREAD INSERTS made by Heli-Coil Corp., Danbury, Conn., used to repair stripped threads more easily than by usual methods, are described in recent release. Inserts are coils of diamond-shaped stainless steel wire which are inserted into a redrilled and tapped hole. **(96)**

ELECTRICAL INSULATION PROTECTION from moisture, temperature and other life-shortening factors, is gained by use of "Safe-T-Seal" compound according to release available from MB Aircraft Services, Burbank, Calif. It shows how compound was used to advantage in Tecolote Tunnel project. **(97)**

DECAL LABELS of metal backed with pressure-sensitive adhesive are described in brochure from C&H Supply Co., Inglewood, Calif. "Metal-Cals" come in older water soaked type too for a wide variety of applications of permanent labeling with colored or etched plates. **(98)**

PLEASE SHOW THIS ADVERTISEMENT TO YOUR BLASTING FOREMAN

for short interval delay blasting use

PRIMACORD MS CONNECTORS

Better fragmentation, reduced vibration, controlled throw . . . these are some of the advantages obtainable with short interval delay firing. Primacord MS Connectors enable you to set up delays in your Primacord surface trunk lines.

The Connector consists of a copper tube about 2¾ inches long, containing an element which produces a delay measured in milliseconds. A piece of Primacord approximately 12 inches long is crimped in each end of the tube. The Primacord trunk line is cut, and the Connector is joined to the two ends with tight square knots. Or, the ends can be lapped to the main line and bound with electrician's tape. It will function equally well lying on the ground, suspended in the air, or covered with sand. In wet conditions the Connectors should be raised out of the water.

Like Primacord itself, the MS Connectors are not affected by stray electrical currents, and can be used whenever such currents might be encountered.

See your explosives supplier or write to

THE ENSIGN-BICKFORD COMPANY • Simsbury, Connecticut

Primacord, Quarrycord, Ignitacord,® Safety Fuse, Blasting Accessories

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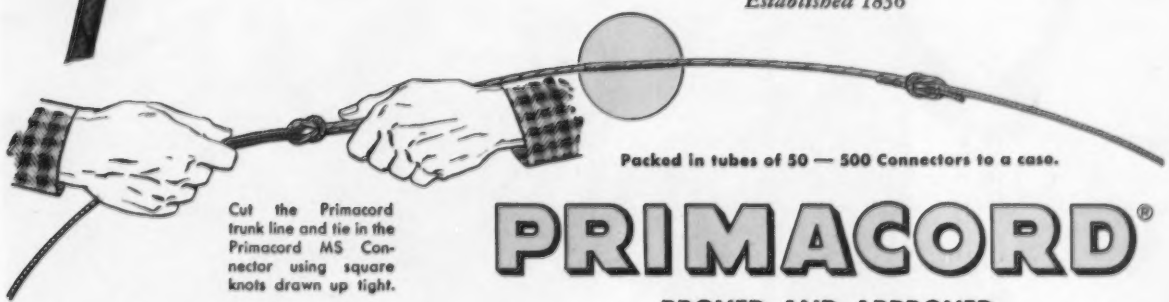

Cut the Primacord trunk line and tie in the Primacord MS Connector using square knots drawn up tight.

Packed in tubes of 50 — 500 Connectors to a case.

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PROVED AND APPROVED DETONATING FUSE

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STARTED A NOISY REVOLUTION

This was no quiet affair for it concerned—and radically altered—existing drilling practice. It started with the introduction of a new drill and a special drill steel developed to work together. This revolutionary drilling unit is the Atlas Copco light rock drill and the Sandvik Coromant tungsten-carbide-tipped drill steel. The measure of this drilling unit's success has been its rapid, wide-scale adoption throughout the drilling world—accompanied, wherever it is in use, by a change to *faster, smoother, far more economical methods.*

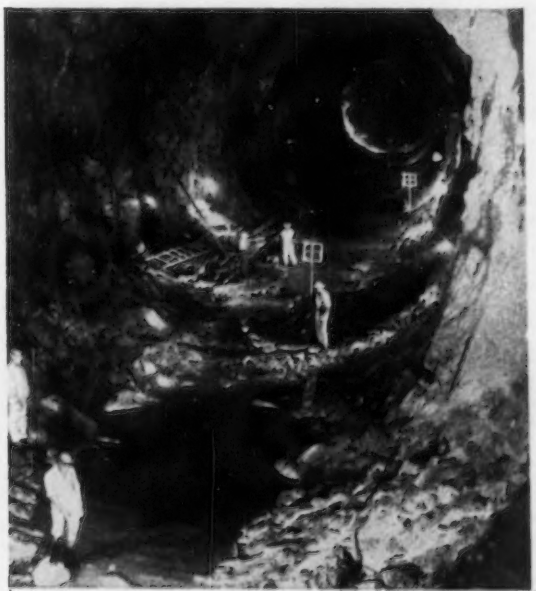
MORE DRILLS AT WORK. A striking advantage of this unit is the compactness and lightness of the Atlas Copco rock drill. This has practically swept away the two-man, bar-rigged drifter and with it, faces cluttered with unproductive crews and bulky equipment. *Atlas Copco rock drills are one-man machines.* That means *more* machines engaged on *actual* drilling operations at one and the same time.

CANADA *Atlas Copco rock drills fitted with Sandvik Coromant drill steels at work on the famous Alcan project, Brit. Columbia.*

DEVELOPED TOGETHER. The Atlas Copco light rock drill is only half the story of this drilling unit. From the earliest research and experimental stages, its development has been tied with that of the Sandvik Coromant tungsten-carbide-tipped drill steel. Work on both has always been towards a combination rock drill and drill steel (a drill and steel produced separately could never be as well balanced or give equivalently high performances), and has been the basis of this drilling unit's outstanding triumph.

MILES OF DRILLING TESTS. A highly important contribution to the development of this revolutionary drilling unit are the hundreds of miles of test drilling carried out each year by Sandvik at their own mine, in close co-operation with Atlas Copco. Other tests are carried out in the mine's rock-drilling laboratory and by Sandvik research teams in Sweden, South Africa and Canada. All this 'backroom' work serves to provide valuable practical information naturally influencing the enormously skilled drill steel production stages. In this, Sandvik are the world's only manufacturers of drill steels to control every phase—from the mining of the iron ore and the processing of wolfram ore to the final, *extra-hard* tungsten-carbide-tipped drill steels.

DRILLED 800 MILLION FEET. Atlas Copco drills and Coromant steels are today's most widely used pusher leg drills and integral steels. This combination is at work down mines and on construction projects throughout the world bringing *trouble-free progress, faster times, new economies and beating schedules and records.* Could there be anything more conclusive of how complete a revolution this drilling unit started than to state that in 1954 it was responsible for drilling no less than 800 million feet—or nineteen times through the globe!



BRAZIL *This circular discharge tunnel for the Paula Afonso project was drilled by Atlas Copco rock drills fitted with Sandvik Coromant drill steels*

SWEDEN *An Atlas Copco rock drill — a one-man machine — in operation down the Persberg Mine. It is fitted with a Sandvik Coromant drill steel.*

Atlas Copco Compressed Air Equipment is manufactured or sold and serviced in 48 countries throughout the world by the *Atlas Copco Group*, which embraces companies trading under various names such as Atlas, Atlas Diesel, Atlas Polar, Atlas Copco, Copco, Delfos and Sampa.

MAIL THIS COUPON to the most convenient of the addresses given here:

U.S.A., Copco Pacific, Ltd., 930 Brittan Avenue, San Carlos, California; Copco Eastern, Ltd., P.O. Box 2568, Paterson 2, N.J.; CANADA, **Canadian Copco, Ltd., Montreal, A.M.F., Quebec;** MEXICO, Atlas Copco Mexicana, S.A., Apartado Postal 56, Torreon, Coahuila; PERU, Compania Atlas del Perú, S.A., Apartado 2982, Lima.

UNITED KINGDOM, The Atlas Diesel Co., Ltd., Wembley, Middx.; FRANCE, Atlas Polar S.A., 29, Rue Marbeuf, Paris 8e; HOLLAND, N.V. Holland-Atlas, P.O. Box 6056, Rotterdam; ITALY, S.A.M.P.A., Viale Marche 15, Milan.

AUSTRALIA, Australian Atlas Company Pty., Limited, P.O. Box 54, Auburn, N.S.W.; SOUTH AFRICA, Delfos Pty. Ltd., P.O. Box 504, Benoni, Transvaal.

Readers in countries outside those listed above and who do not know the name of their local Atlas Copco company or agent, please write, in the first instance, to AB Atlas Diesel, Stockholm 1, Sweden.

Please forward details of ***Atlas Copco Rock Drills and Sandvik Coromant Drill Steels.***

NAME .....

COMPANY .....

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* I am also interested in other Atlas Copco equipment (please state which below)

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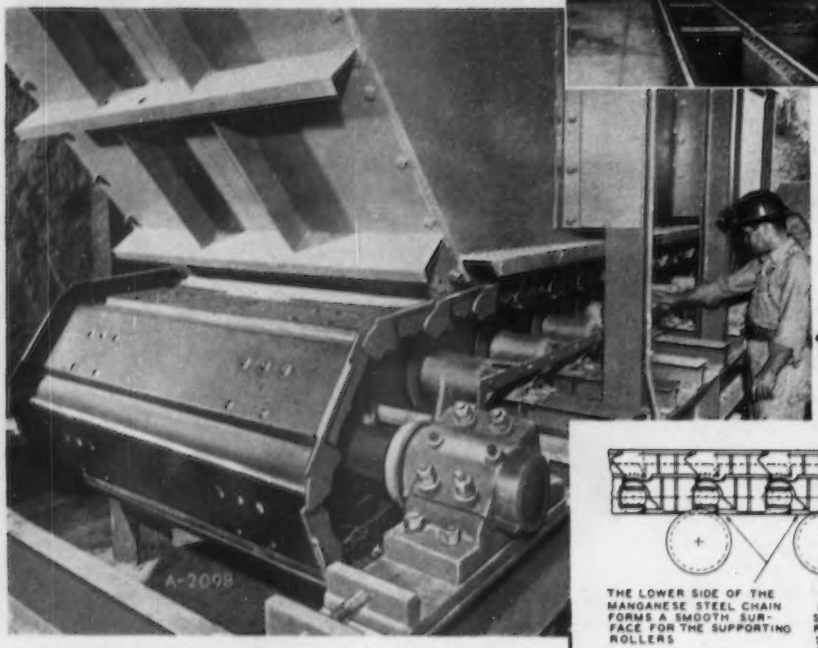
* *Manufacturers of Stationary and Portable Compressors, Rock-Drilling Equipment, Loaders, Pneumatic Tools and Paint-Spraying Equipment*

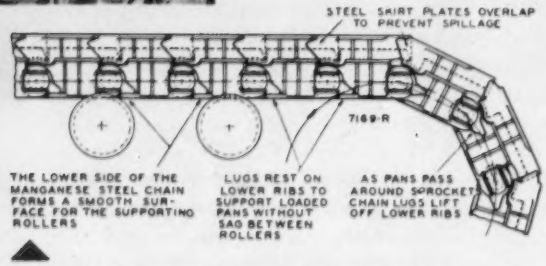
THE ATLAS COPCO GROUP OF COMPANIES

S-A "AMSCO" MANGANESE FEEDERS



"AMSCO" Feeders withstand the punishing impact and abrasion of ore loads—often falling many feet—through multi-million ton service. One unit logged over 26-million tons in a seven year period, another has handled 65-million tons in 23 years . . . typical examples of outstanding service in both long life and tonnage.

This "AMSCO" secondary feeder discharges to belt conveyor. An S-A Tel-level control automatically stops the feeder if there is a choke-up.


STEEL SKIRT PLATES OVERLAP TO PREVENT SPILLAGE
7169-R
THE LOWER SIDE OF THE MANGANESE STEEL CHAIN FORMS A SMOOTH SURFACE FOR THE SUPPORTING ROLLERS
LUGS REST ON LOWER RIBS TO SUPPORT LOADED PANS WITHOUT SAG BETWEEN ROLLERS
AS PANS PASS AROUND SPROCKET CHAIN LUGS LIFT OFF LOWER RIBS

Elevation of S-A "AMSCO" pans and chain showing knee-action lugs at joints. Lugs permit chain to bend freely around sprockets but prevent sagging between track-rollers, even under load. Bottom of chain forms a smooth surface for the track-rollers.

No Matter How Brutal the Beating, They Come Back for More...MUCH LONGER

Because all wearing parts are made of MANGANESE, the toughest steel known to man

Thousands of tons of ore and rock crash down every day . . . and these smashing, loading impacts continue year after year . . . yet S-A "AMSCO" Feeders unfailingly handle high tonnages from car dumps, primary crushers and loading pockets—feeding to or from scalping screens — meeting every application where feeders must absorb heaviest abrasive punishment . . . with practically no maintenance.

Nothing but Manganese steel will withstand these repeated, punishing impacts, this constant abrasive action . . . that's why in S-A "AMSCO" Feeders, pans, chains, pins, bushings, track roller, sprocket — in fact *all components subject to wear* — are made of manganese steel . . . and actually become tougher and more abrasion-resistant with repeated shocks.

S-A "AMSCO" Feeders are individually engineered to provide lowest cost-per-ton handling for heaviest-duty applications. Tremendous in size and capacity, they have a life expectancy rated in millions of tons — as proved by their record in mines since 1924. Just issued—Bulletin No. 55 giving complete data. Write for your copy today.

STEPHENS-ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Ill. • Los Angeles, Calif. • Belleville, Ont.

Engineering Division
Specialists in the design and manufacture of all types of bulk materials conveying systems.

Standard Products Division
A complete line of conveyor accessories including centrifugal loaders—car pullers—bin level controls—etc.

Sealmaster Division
A complete line of industrial ball bearing units available in both standard and special housings.

FACING A TOUGH PROPOSITION?

you can beat it with JALLOY

Only a seasoned hunter with the right equipment can stand up to a charging rhino. And, likewise, only a special steel like JALLOY can withstand severe impact and abrasion . . . day after day. In comparison with mild steels as well as other abrasion-resistant steels, JALLOY gives outstanding results when heat-treated to your specifications.

This modern heat-treated plate brings savings in steel costs, maintenance, and repair, and also is easily welded. JALLOY is available in three grades, each of which is designed for specific applications.

Jalloy Plates outlast other steels by margins of 4 to 1

Jalloy lowers maintenance costs on ore and coal conveyors

Jalloy provides longer wear with less repair in truck bodies

Jalloy Aprons in Tyrock screen last 3 times as long as other steels

Jalloy heat-treated steel plate beats wear due to impact and abrasion

J&L STEEL

Complete data concerning CHEMICAL COMPOSITION . . . HEAT TREATMENT . . . WELDABILITY . . . PHYSICAL PROPERTIES . . . will be mailed to you promptly. Write today.

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

Jones & Laughlin Steel Corporation
3 Gateway Center, Dept. 412, Pittsburgh 30, Pa.

☐ Please mail complete data concerning Jalloy.
☐ Please have your representative call.

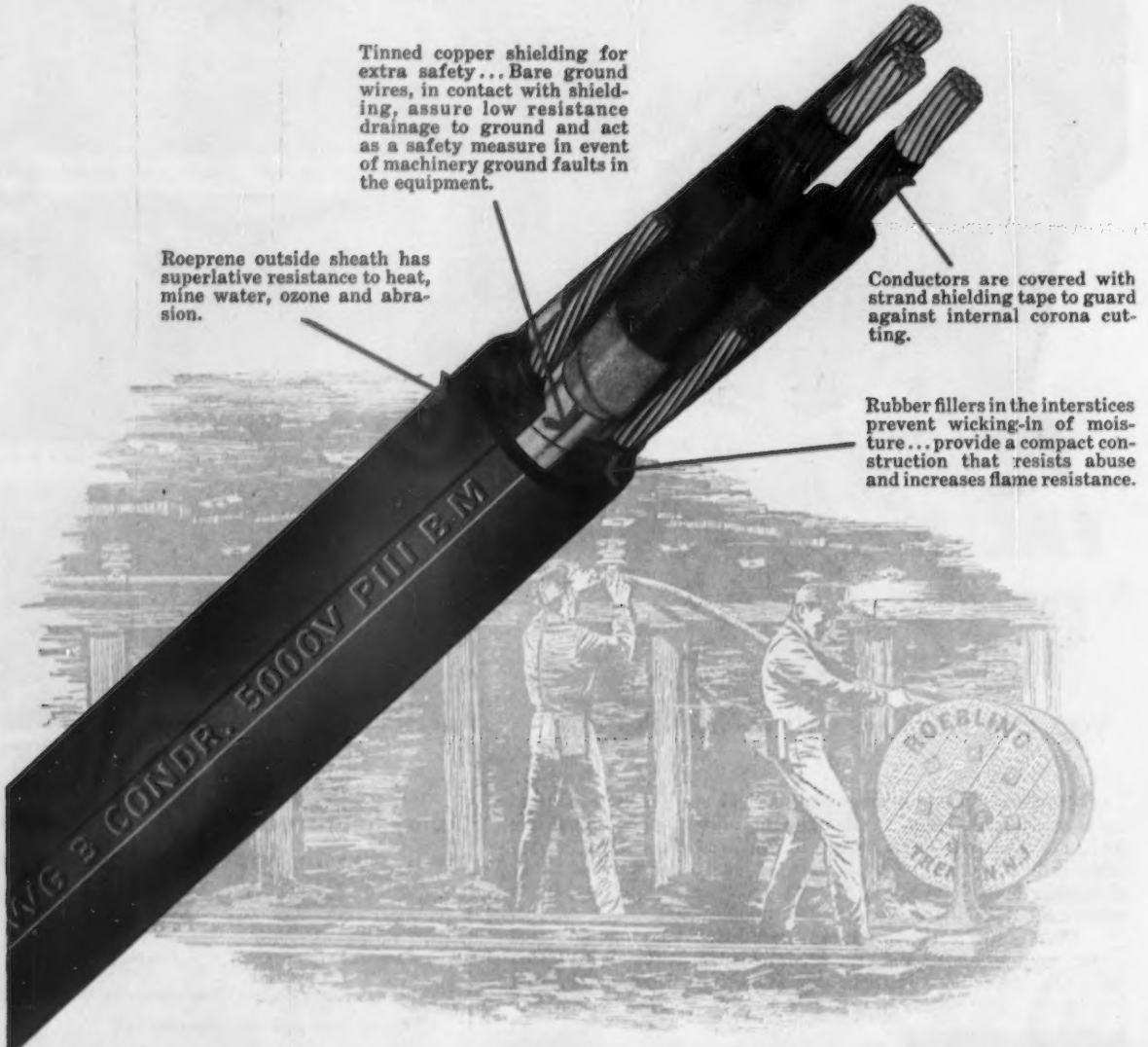
Name _____
Title _____
Company _____
Address _____
City _____ Zone ____ State _____

MINE POWER FEEDER CABLE

TODAY'S TOP SPECIFICATION FOR MINE POWER DISTRIBUTION

NON-METALLIC ARMORED . . . shielded . . . Roebling high-voltage Mine Power Feeder Cable is perfectly adapted for practically every sort of power distribution requirement. You can suspend it vertically in shafts or boreholes; run it horizontally in underground entries or suspended from insulators. Since its outer sheath has high resistance to moisture, abrasion and other service hazards, you can safely bury it direct in shallow trenches.

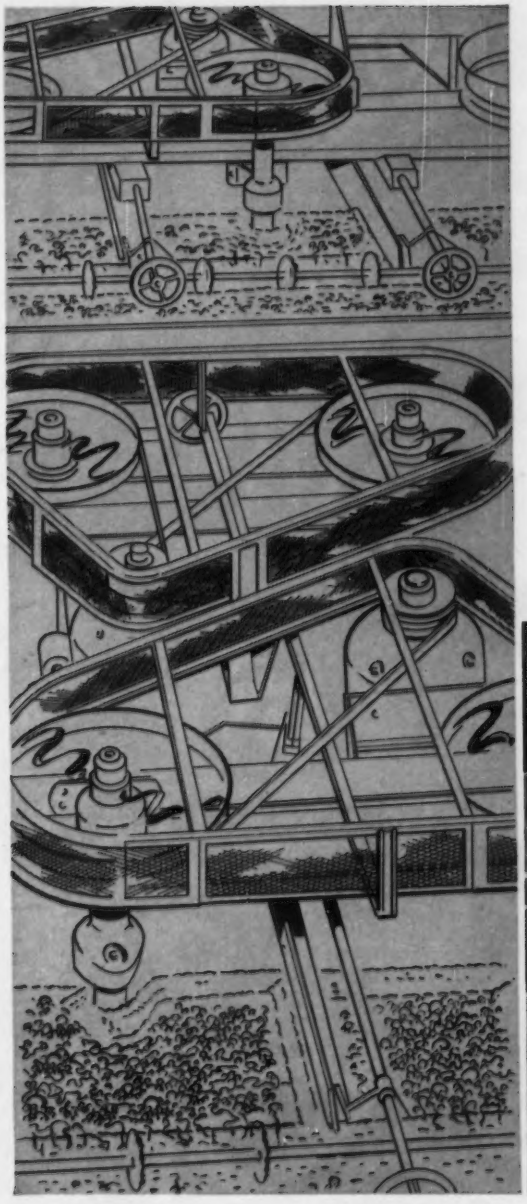
Roebling Mine Power Feeder Cable has every construction feature that assures maximum safety, dependability and service life. Classified as semi-portable, it is exceptionally easy to move and handle under all conditions. Get complete information on Roebling Mine Power Feeder Cable from your Roebling distributor or by writing us.


Tinned copper shielding for extra safety... Bare ground wires, in contact with shielding, assure low resistance drainage to ground and act as a safety measure in event of machinery ground faults in the equipment.
Roeprene outside sheath has superlative resistance to heat, mine water, ozone and abrasion.
Conductors are covered with strand shielding tape to guard against internal corona cutting.
Rubber fillers in the interstices prevent wicking-in of moisture... provide a compact construction that resists abuse and increases flame resistance.
NG 2 CONDR. 5000V PILC B.M.
ROEBLING

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1930 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.



DOW

MORE COLLECTOR FOR YOUR MONEY...

Dow Xanthate Z-11, as recommended by our Mining Technical Service, can give you better metallurgy at lower cost

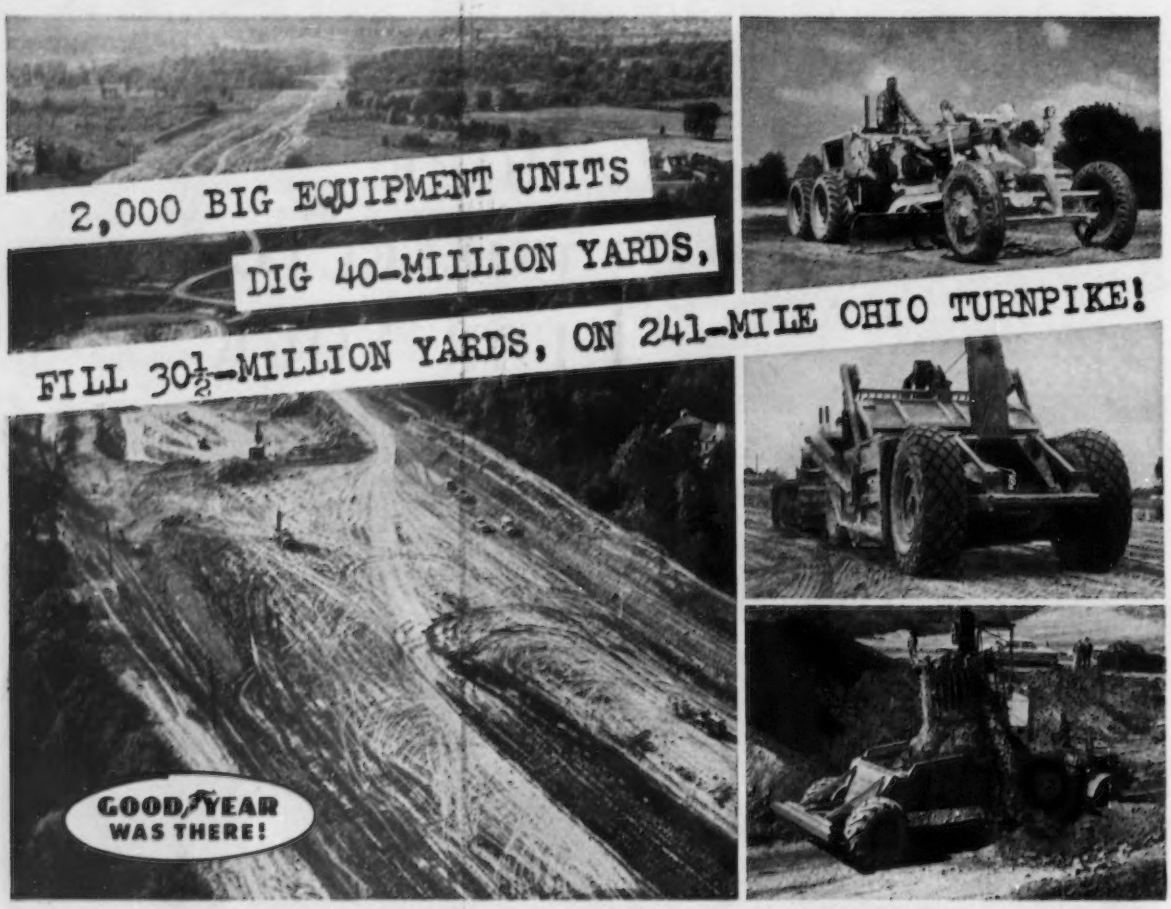
Get rid of those complex collector combinations, by replacing them with Dow's new Xanthate Z®-11 and proper pulp conditioners, with the help of our Mining Technical Service group. You can actually *reduce* collector consumption while *increasing* metal recovery.

This sodium isopropyl Xanthate is a powerful general purpose collector for improved flotation of all sulfides including pyrite. Since Xanthate Z-11 is substantially nonfrothing, it makes possible more exact, independent control of collector and frother.

And if excessive frother consumption has you worried, Dowfroth® 250 can cut that cost by 50%—has done even better than that in some mill operations while producing improved metallurgy.

For many years, Dow has helped promote flotation economy through research. For consideration of your problem, or samples of dependable Dow reagents, write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. OC 815H-1.

you can depend on DOW CHEMICALS DOW



Soon to be humming to the tune of 39,000 vehicles a day, Ohio's new 241-mile toll road, of twin 24-foot pavements on 200 foot right of way, is taking less than 3 years from start to finish! This fast-stepping 20-hour-a-day pace is maintained by equipment drawn from all over the country—much of it rolling on Goodyear earth-mover and off-road tires built with 3-T NYLON Cord.

Look for this sign; there's a Goodyear dealer near you

YOU set the pace—
TIRES OF 3-T NYLON CORD CAN TAKE IT!

Tires built with Goodyear's *exclusive*-process 3-T NYLON Cord have been on the toughest, fastest-moving jobs for almost 2 years. In that time, they've proved themselves *the greatest moneysavers for truckers and contractors in 20 years!* 3-T NYLON CORD keeps bruise breaks and heat blowouts close to the vanishing point, virtually eliminates ply separation and flex failure — keeps tires in shape for many more re-lugs and recaps. If you want to cut your tire-cost-per-job, specify Goodyear 3-T Cord tires—Rayon or Nylon—for everything that rolls!

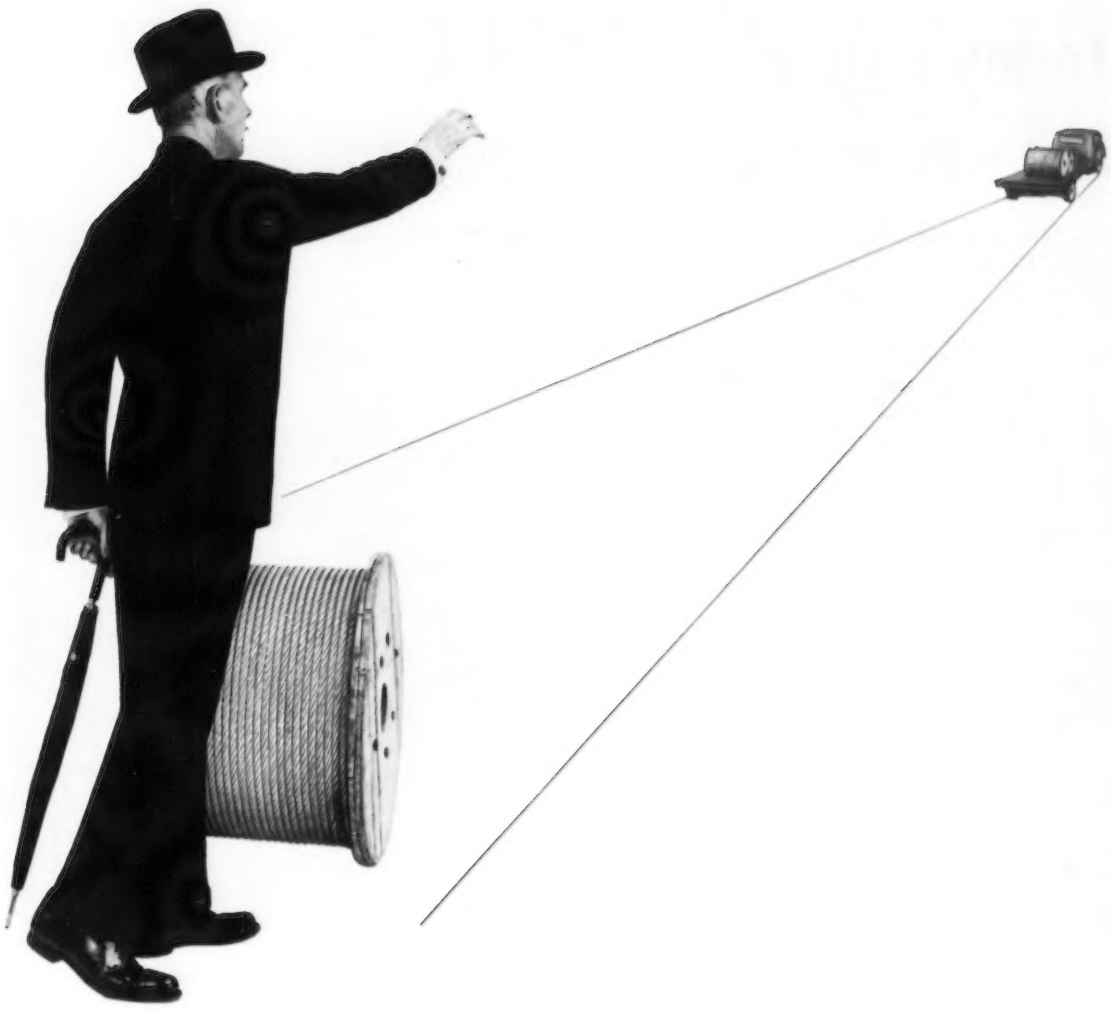
Goodyear, Truck Tire Dept., Akron 16, Ohio

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE BUILT WITH 3-T NYLON CORD

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Road Lug, Sure-Grip, All-Weather—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio



YOUR WICKWIRE ROPE DISTRIBUTOR SAVES YOU DOWN TIME

When the lack of the proper wire rope halts your production or your operations, thank your lucky stars that your helpful Wickwire distributor is only a quick phone call away. It's a wonderful feeling...to know you'll be getting exactly what you need from his warehouse stocks in only a few hours time.

Now contrast that with the cost in time, money and inconvenience of emergency shipments direct from a distant manufacturer.

In addition to saving on down time, your Wickwire distributor effects further economies by recommending the wire rope that will give you the longest service life, by minimizing your bookkeeping, inventory maintenance and transportation costs. He keeps your reserve stocks for you so that you don't tie up capital in stand-by materials, warehouse space and unnecessary stock insurance and handling.

Your Wickwire Rope distributor is a good man to know. He's quality people handling quality products. Buy your wire rope and slings from him. You'll find that the many valuable services he offers far outweigh any apparent price advantage you might gain by buying direct.

CF&I WICKWIRE ROPE A CF&I PRODUCT

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

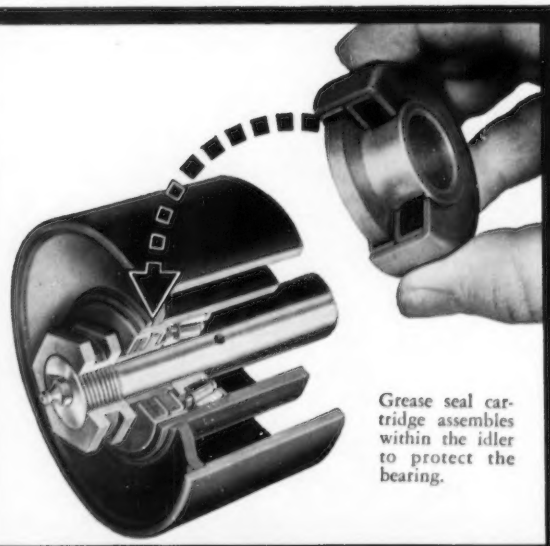
3152

Today's simplest IDLER GREASE SEAL is also the best-performing

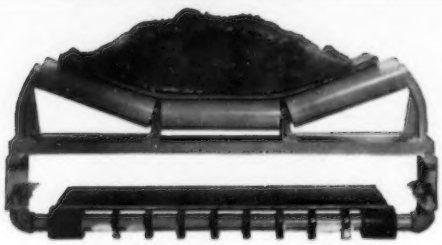
THE cartridge grease seal used on Link-Belt belt conveyor idlers provides the effectiveness of multiple sealing with the convenience of a single unit. A contact seal of laminated felt and neoprene combined with a labyrinth keeps dirt out, grease in. And the grease itself within the labyrinth further prevents entrance of dirt or other matter. What's more, no springs or loose washers are involved . . . there's no chance for metal-on-metal friction. The entire assembly comprises a rugged, compact "cartridge."

Simplicity is only one of the big advantages you get with Link-Belt idlers. Check the others below. For complete facts ask your nearby Link-Belt office or authorized stock-carrying distributor for a copy of Book 2416. It lists over 500 sizes in 34 types, including troughing, variable troughing, flat belt, belt training and rubber cushion idlers.

Sturdy, rigid frames support rolls in perfect alignment. Rolls are securely held in place but easily removed for inspection and service.



Grease seal cartridge assembles within the idler to protect the bearing.



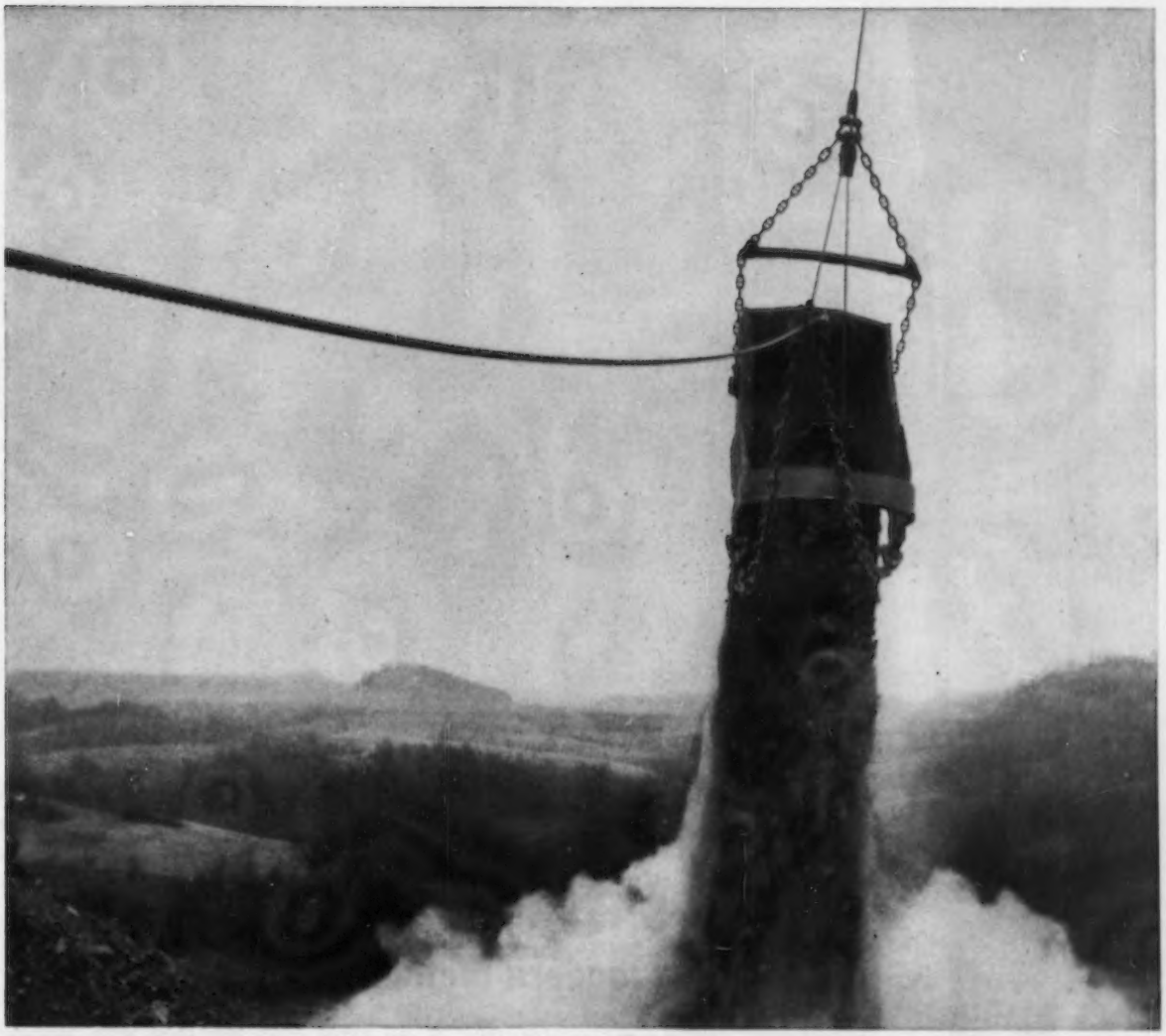
You'll find these 6 features throughout industry's most comprehensive idler line

1. **HUSKY, HIGHEST QUALITY BEARINGS,** free and easy turning, assure maximum life, minimum belt-wear, low power consumption. Concentricity is secured by unit mounting of bearings in a heavy-wall center tube.
2. **SAFE, CONVENIENT GREASE FITTINGS** protected by flange ribs of support brackets provide ease of lubrication—lubrication for longer life.
3. **CONCENTRIC ROLLS** have smooth surfaces and rounded edges. Machine-made, continuous welds prevent entrance of dirt and moisture.
4. **HOP-FREE ROTATION** is assured by close tolerances, press fits and precision assembly from shaft to shell.
5. **STRONG, RIGID FRAMES** support rolls in perfect alignment. Rolls are securely held in place but can be easily removed for inspection and service.
6. **GROOVED HEX NUTS** lock into malleable brackets, creating bridge truss effect—prevent shaft rotation and bracket spreading under load.

LINK-BELT

BELT CONVEYOR IDLERS

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13.805



Here's where J&L Wire Rope cuts your costs

On the big rigs like this, wire rope is an important cost item. That's why so many big mining men look to J&L for Wire Rope that fits their equipment requirements . . . for the right combination of strength, flexibility and toughness to stay on the job.

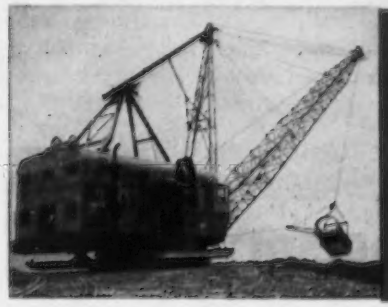
They've found the quality of J&L Wire Rope is reflected on the profit sheet in terms of minimum downtime for re-rigging, lower rope costs and more tons mined per wire rope dollar.

J&L Wire Rope quality is the combination of more than 100 years of steelmaking experience, topflight wire rope engineering and the most modern production equipment. The result—every wire, every strand, every J&L Wire Rope is "precisionbilt" for maximum service.

No matter what equipment you're operating there's a J&L Wire Rope designed to give you cost-cutting service life. Write today for complete information on J&L Wire Ropes.

Jones & Laughlin

STEEL CORPORATION — *Pittsburgh*



J&L STEEL

Jones & Laughlin Steel Corporation
412 Gateway Center, Pittsburgh 30, Pa.

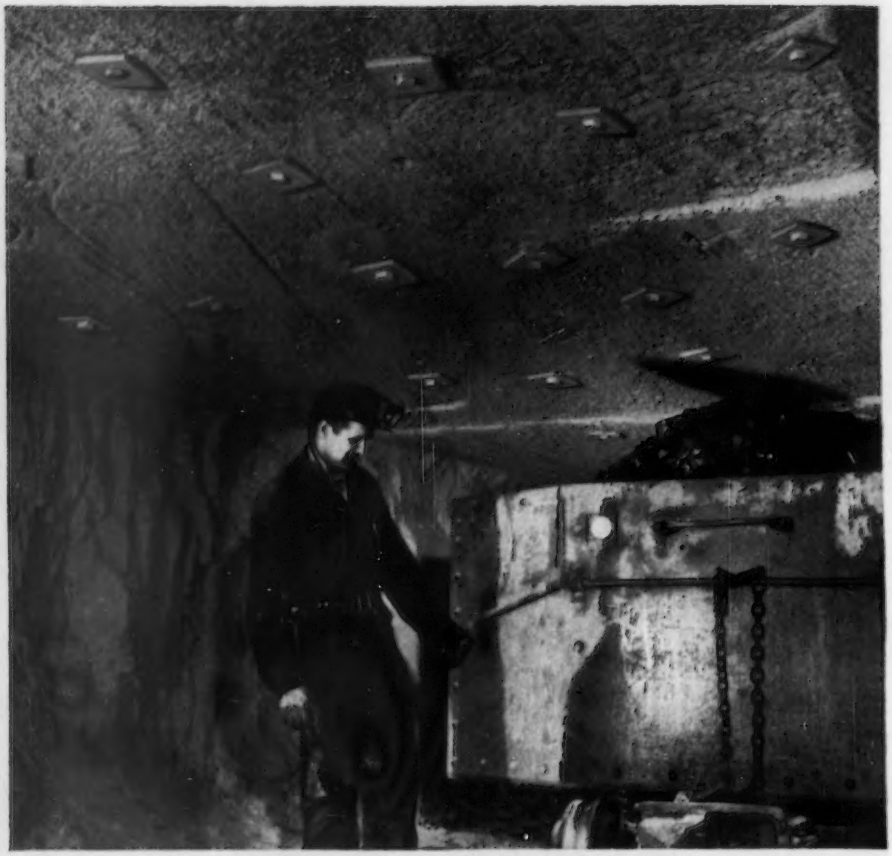
Please send me complete information on J&L Wire Ropes.
Please have your representative call.

Name_____

Title_____

Company_____

Address_____



BETTER SAFETY... HIGHER OUTPUT

with this modern method of roof-support

By anchoring layers of rock above haulageways and at other critical locations, the Bethlehem square-head roof bolt is helping to make mines safer, and more productive. This method of roof-support also improves ventilation, as there are no bulky supports to hinder air-flow. Production is increased, too, for there is more room in which to maneuver mechanized equipment.

Bethlehem square-head roof bolts come in three types:

(1) A ¾-in. diam carbon-steel bolt. Typical breaking load, 24,000 lb.
(2) A ⅝-in. diam high-strength bolt. Typical breaking load, 24,000 lb.
(3) A ⅞-in. diam high-strength bolt. Typical breaking load, 45,000 lb.

All three bolts are used with Bethlehem's Type C leaf-type malleable-iron shell (with steel plug), and hardened washer. When bolt is tightened in 1⅜-in. diam hole, the plug is drawn down on the threads, expanding the shell so that it locks against sides of the hole. The hardened washer reduces friction between the bolt head and the roof plate, which is caused by high tension in the bolt producing excessive bearing pressure. Because of the washer, impact wrenches can be used freely, without galling or tearing of metal.

We'll be glad to talk over with you the benefits to be derived from a roof-bolting program in your mine. Just get in touch with the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

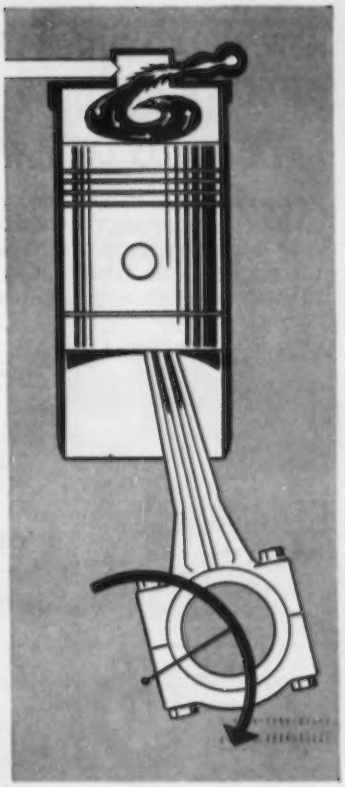
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM MINE ROOF BOLTS

BETHLEHEM STEEL

The New Allis-Chalmers Power Unit Line Delivers

LOWER COST POWER

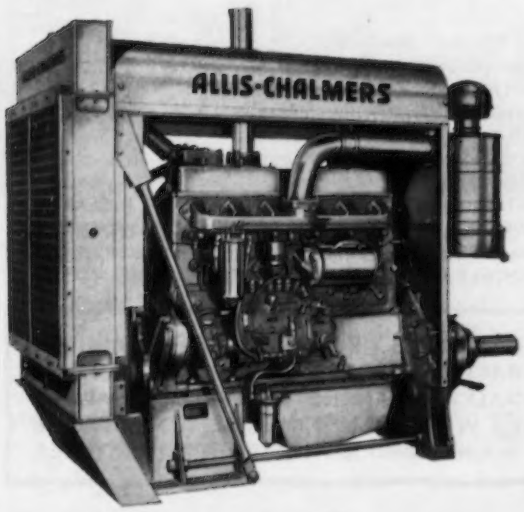


Allis-Chalmers diesel power units provide a new kind of engine performance and extra-long life. Heart of this outstanding performance is a unique *follow-through* combustion. Here's how it works —

A blast from the energy cell (see drawing), thoroughly mixes air and fuel for complete burning in the combustion chamber. This results in peak efficiency, lower cylinder temperatures for more complete lubrication of walls, longer life for pistons and rings.

In addition, Allis-Chalmers power units are designed with seven main bearings, rigid blocks, removable "wet" cylinder sleeves, removable valve guides, full-length water jackets, full-pressure lubrication — all contributing to dependable, continuous, long life performance.

Ask your Allis-Chalmers dealer for the visual story revealing the full advantages of these engines.



Five sizes of Allis-Chalmers diesel power units — ranging from 15 to 197 brake hp — are available as open style or complete self-contained units. They are compact and easily installed

Illustrated: Model D-779

6-cylinder diesel

140 brake hp at 1400 rpm

779 cu in. displacement

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

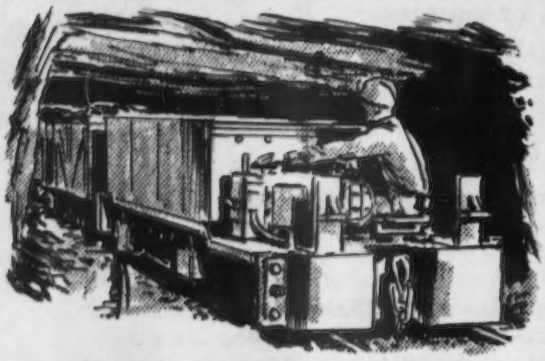
FACTS ABOUT Exide®

IRONCLAD® MINING BATTERIES

NEW WAY TO CUT COSTS, BOOST PRODUCTION...

TWO-WAY MINE TRACTOR SERVICE ...DEPENDS ON EXIDE-IRONCLAD POWER!

LOOKING FOR A WAY TO CUT PORTAL-TO-PORTAL TRAVEL TIME 50%...TO MOVE SUPPLIES AND EQUIPMENT WITHOUT HALTING THE NORMAL FLOW OF PRODUCTION? EXIDE-POWERED RUBBER-TIRED TRACTORS AND TRAILERS, LIKE THE KERSEY TRACTOR SHOWN, DO SERVICE JOBS FASTER... SAFER...AT LOWER COST. USE TRACTORS-POWERED WITH LONG-LIFE EXIDES FOR FAST, LOW-COST HAULAGE!



MORE TRIPS PER SHIFT! WITH DEPENDABLE EXIDE-IRONCLADS...

CAR CHANGES ARE SPEEDED, LOADERS KEPT BUSY, AND HAULAGE MOVES FAST WHEN LOCOMOTIVES ARE POWERED WITH EXIDE-IRONCLADS. EQUIPMENT WORKS FULL-SHIFT, DOWN-TIME IS ELIMINATED. YOU GET MORE PRODUCTION PER MAN-HOUR WITH LESS COST PER TON HANDLED. DEPENDABILITY AND LONG USEFUL LIFE MAKE EXIDE-IRONCLADS YOUR BEST POWER BUY-

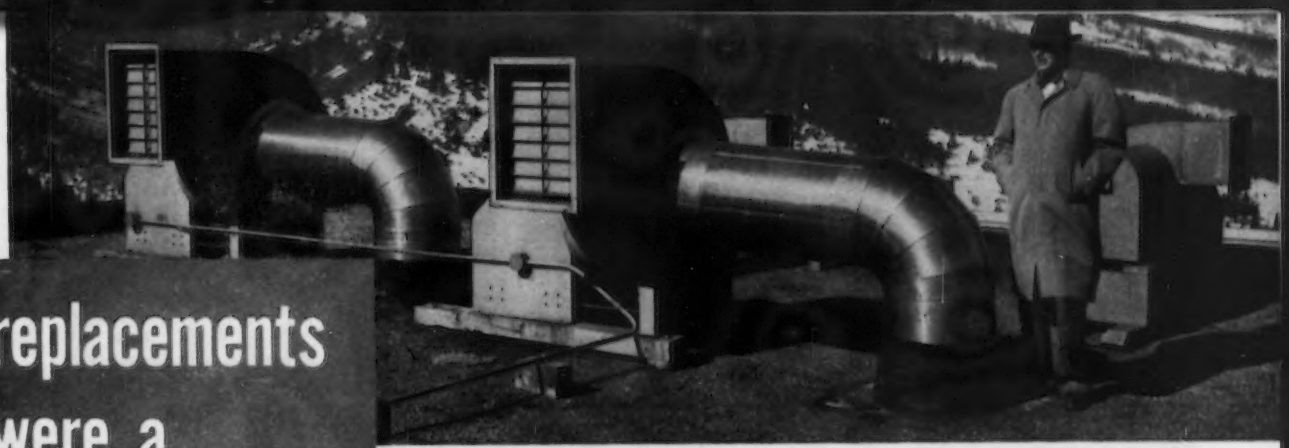
AT ANY PRICE!

WORKED TO DEATH TO LEARN SECRET OF LONGER LIFE...

LAB TESTS OF IRONCLADS AGAINST CONVENTIONAL BATTERIES SHOW THAT THEY PERFORM BETTER... HAVE FROM 20% TO 30% LONGER LIFE! THESE FACTS, DEMONSTRATED BY THOUSANDS OF BATTERY USERS, EXPLAIN WHY EXIDE-IRONCLADS ARE YOUR BEST MINING BATTERY BUY-**AT ANY PRICE!** SINCE 1910, RESEARCHERS HAVE GREATLY IMPROVED EXIDE-IRONCLAD PERFORMANCE AND USEFUL WORKING LIFE, BUT THE BASIC IRONCLAD PRINCIPLE OF TUBULAR CONSTRUCTION REMAINS THE SAME.

LET EXIDE HELP SOLVE YOUR MINING BATTERY PROBLEMS. ❶ CALL AN EXIDE SALES ENGINEER FOR FULL DETAILS. ❷ WRITE FOR FORM 1982, A MANUAL ON MAINTAINING MOTIVE POWER BATTERIES.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.



replacements were a problem, so—

"We rebuilt with Stainless Steel!"

says The New Jersey Zinc Company

These pictures were taken at the Gilman, Colorado, operation of The New Jersey Zinc Company—W. L. Jude, Superintendent. A few years ago, the company got fed up with the constant replacement of laboratory fume hoods. Because of the corrosive fumes, the previous hoods would look like sieves after as little as 3 months. They had a *maximum* life of 18 months.

Now the Stainless Steel hoods have been in service for 5 years, and they still look like new. The installation was not difficult. Less bracing and underpinning was needed because of the inherent strength of the Stainless Steel.

It is difficult to predict the life of these hoods, since they show no signs of failure. But, Mr. Jude says, "... at the very least, we expect them to last as long as the building."

There is no substitute for Stainless Steel in a job like this. We mean its corrosion resistance, strength and ease of fabrication. When you buy new equipment, specify service-tested USS Stainless Steel.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

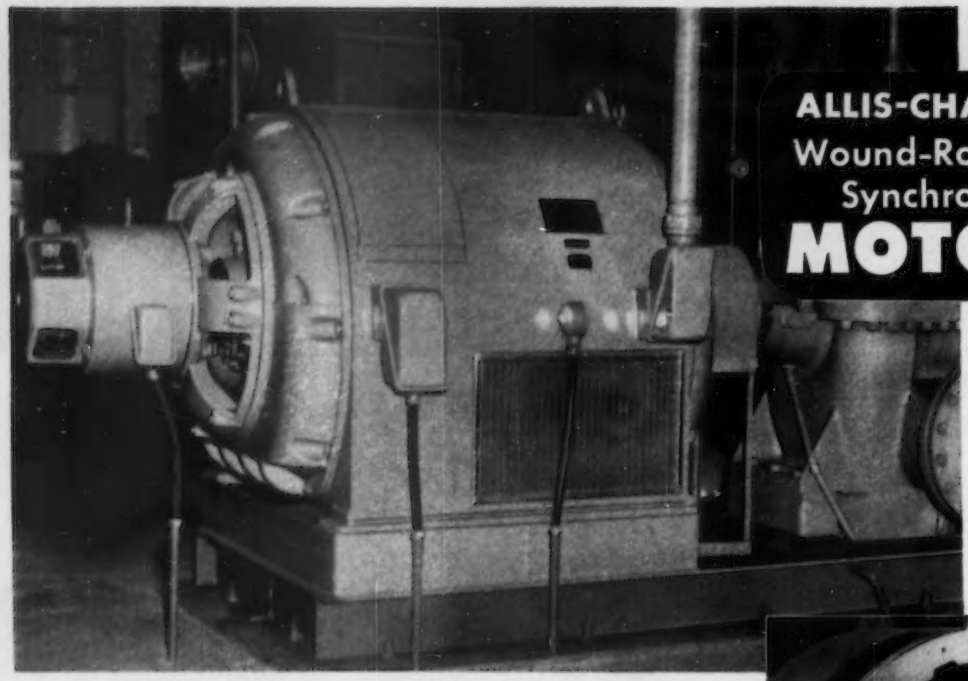
USS STAINLESS STEEL

USS

SHEETS • STRIP • PLATES • BARS • BILLETS • PIPE • TUBES • WIRE • SPECIAL SECTIONS

5-1240

UNITED STATES STEEL



ALLIS-CHALMERS
Wound-Rotor and Synchronous
MOTORS

Shown is a 400-hp, 900-rpm end-shield bearing synchronous motor. Other Allis-Chalmers motors of this design are available from 250 hp at 300 rpm and up, in drip-proof and splash-proof construction.

Now full protection without loss of accessibility

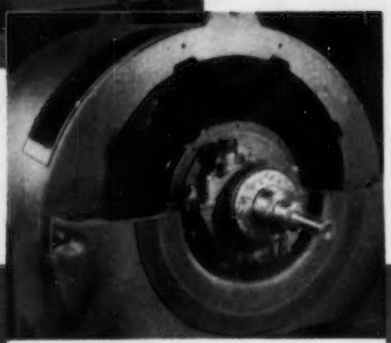
All parts, including slip rings and leads, are enclosed — yet removable inspection covers and end-shield sections simplify maintenance.

These motors combine modern functional design with maximum protection and accessibility.

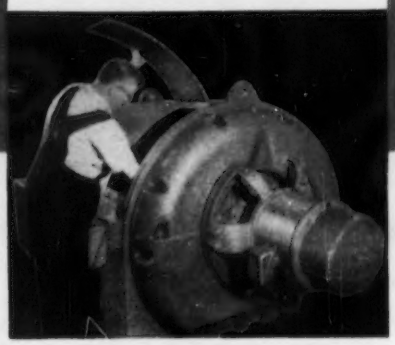
Here are some of the important features:

- Collectors and brushes are protected by box-type stator yoke from physical damage, dripping moisture, dust and dirt.
- Cast end shields provide rigid bearing support and full protection for motor windings.
- Slip-ring leads are brought out to a terminal box — they are not left exposed.
- Capsule-type sleeve bearings permit inspection or cleaning of motor windings without exposing interior of bearing to dirt.
- Access covers are secured by easy-operating, self-locking fasteners for ready removal.

Get details — Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin. Ask for Bulletin 05R8183.



Note accessibility offered by generous size opening covers. Upper half of end shield is removable for entrance to motor winding.



A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-4847

SHEETS • STRIP • PLATES • BARS • BILLETS • PIPE • TUBES • WIRE • SPECIAL SECTIONS 5-1240

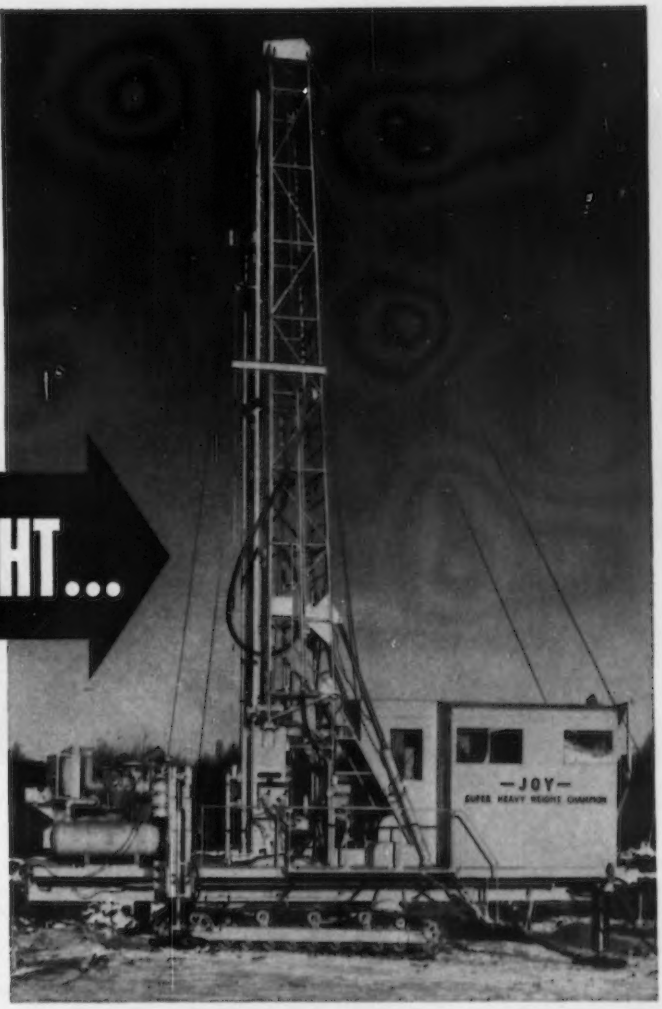
UNITED STATES STEEL

MEET "BIG BROTHER"

... the 60-BH

SUPER HEAVYWEIGHT...

CHAMPION BLASTHOLE DRILL



Here is the new, *larger,* heavier Joy Champion Rotary Blasthole Drill . . . the "big brother" of the Middleweight and Heavyweight Champions, the Joy drills which pioneered revolutionary rotary-air blast drilling. It is designed specifically for large (9″ to 12″) hole-drilling in harder rock.

Proof of its ability to tackle the toughest open cut mining and quarry jobs is the record of the unit illustrated. This Super Heavyweight has been performing very satisfactorily in the hard taconite formations of the Minnesota Iron Range.

The 60-BH Super Heavyweight is a rugged, heavy-duty, low maintenance machine, built to last and produce. Write, now, for complete details to *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.* In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Check these super heavyweight Features:

DRILLS DRY . . . No freezing water lines, no costly water hauling.

NO LOST HOLES . . . Rigid drilling stem, controllable feed pressure, infinitely variable rotation speed prevent bit wander.

QUICK SETUP . . . *Hydraulically raised mast* and hydraulic levelling jacks.

DRILLS CLEAN . . . Continuous, instant removal of cuttings by a blast of compressed air.

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AMPLE WEIGHT . . . Enough to handle big 9″ to 12″ holes.

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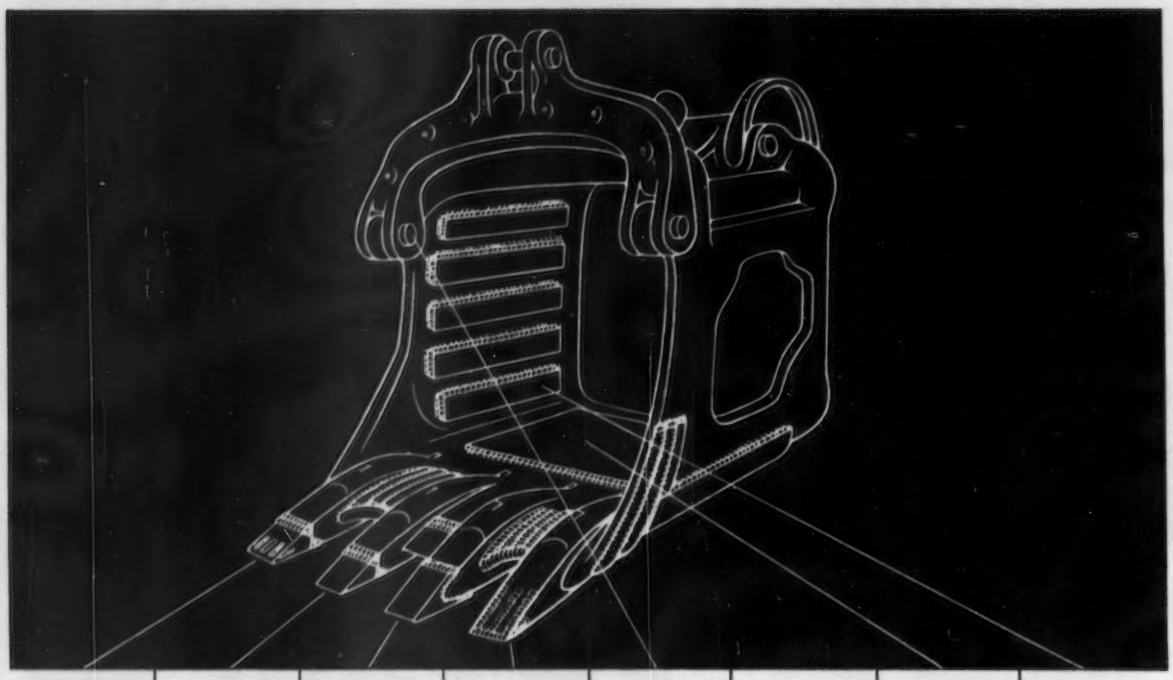
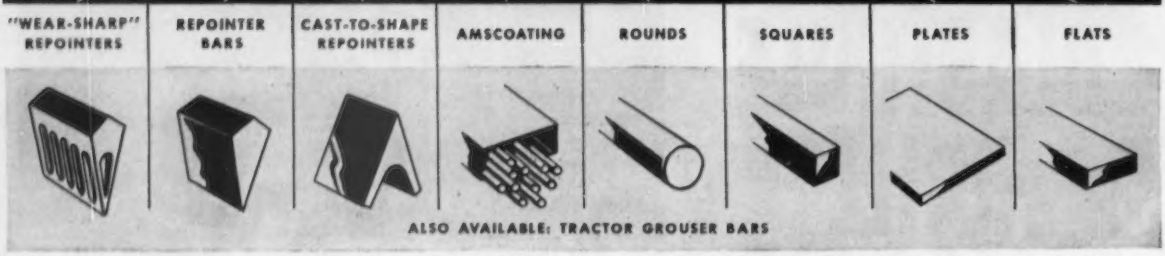
PIONEER AND WORLD'S LARGEST
MANUFACTURER OF ROTARY BLAST HOLE DRILLS

For EXTRA TOUGH build-up and repair





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Put manganese steel at the points of maximum wear and operate equipment longer between repair periods. Amsco manganese steel outlasts other steels by as much as ten to one under conditions of heavy impact and severe abrasion.

Impact work-hardens the metal to as high as 550 BHN. Further abrasion only polishes this tough steel. Amsco Bulletin WA-77 will show you how and where you can make extensive savings using Amsco manganese steel shapes. Write for it today.

For immediate savings, contact your Amsco distributor. He stocks a complete line of manganese steel shapes and welding equipment. Welding products are distributed in Canada by Canadian Liquid Air Co., Ltd.

Amsco also produces other alloy steels with maximum wear-resistance under particular service conditions . . . and a complete line of hardfacing welding equipment, both rods and machines.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

Cyanamid REAGENT NEWS

"ore-dressing ideas you can use"

Cuts Frother Costs Substantially by Replacing Cresylic Acid with AEROFROTH® 65 *Frother*

This copper property treating 220 tpd of an ore assaying 2.2% Cu had been using 0.5 lb. cresylic acid per ton of ore treated. Concentrates average 22%; tails average 0.2% copper. Mill tests showed that as little as 0.014 lb. of AEROFROTH 65 Frother could be used without any change in metallurgy.

The mill is now firmly established on AEROFROTH 65 Frother at the rate of 0.014 lb. per ton of ore treated. Daily frother consumption is now only 3.1 lb. of AEROFROTH 65 Frother instead of 110 lb. of cresylic acid. Other reagents used include 0.03 lb. AEROFLOAT® 238 Promoter; 0.03 lb. Sodium Ethyl Xanthate, and 8.0 lb. of lime per ton of ore treated.

This, we admit, is an unusual case. But it does indicate the substantial savings that may be made by substituting the proper AEROFROTH Frother for less efficient reagents. The Cyanamid Reagent family includes 5 AEROFROTH Frothers with a wide range of froth characteristics. These are described in Mineral Dressing Notes #20—"Cyanamid Reagents" which we will be pleased to send on request. A Cyanamid Field Engineer will be glad to work with you in selecting the frother best suited to your ore.

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.

Cable Address — Limenitro, New York

NORTH AMERICAN CYANAMID LIMITED
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E. P. CADWELL, Casilla 12983,
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377 Little Collins St., Melbourne C. 1, Australia

Printed in U. S. A.

Cut Your Haul Costs With This High-Speed, Big-Capacity ATHEY-CAT Rear Dump Team

Athey-Cat Rear Dump Haulers make more trips per hour . . . move more yards per day . . . net more profits per job! Here's how they do it: the PR21 Trailer has a big 14′ x 9″ target for fast-swinging shovels, reducing loading time. 9′ 5″ is the loading height . . . low enough for loading in tunnels and to keep the shovels working at maximum production. And you don't have to "take it easy" with the PR21, because it's built to take the shock of falling rock and the twist of high-speed going over rough roads. All-welded, hi-strength steel box-type body with triple-ply bottom, cushions and absorbs the shock.

The PR21-DW21 Team hauls a 31-ton load at 25.1 m.p.h. Positive, hydraulic steering permits the Athey-Cat Team to make short turns and spot the load right where you want it. Fast, 3-stage hydraulic rams dump the load cleanly and quickly.

For lower costs and increased profit at your mine, have your Athey-Caterpillar Dealer show you all of these PR21 advantages. There are many more! See him soon.

YOUR ATHEY DEALER IS YOUR CATERPILLAR DEALER

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use CF&I GRINDING BALLS in wet grinding for:

- high impact and abrasion resistance
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- thoroughly inspected grinding balls free of surface pits, circumferential ridges and other surface unevenness
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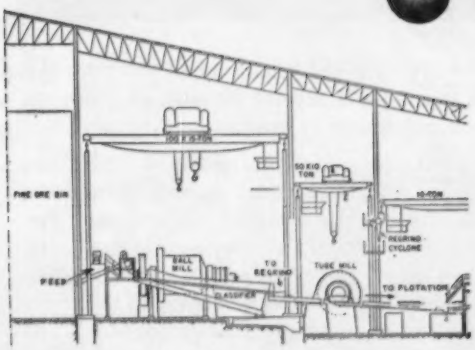

These advantages are yours because CF&I Grinding Balls are made of tough, hot-forged special analysis steel heat-treated to give uniform wearing qualities. These grinding balls are available in diameters from ¾" to 5".

CF&I Steel Products for the Mining Industry

Rock Bolts • Grinding Rods • Wickwire Rope
Mine Rails and Accessories • Cal-Wic Industrial Screens

FORGED STEEL GRINDING BALLS
THE COLORADO FUEL AND IRON CORPORATION
CF&I

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GM DIESEL
CASE HISTORY No. IA3-15

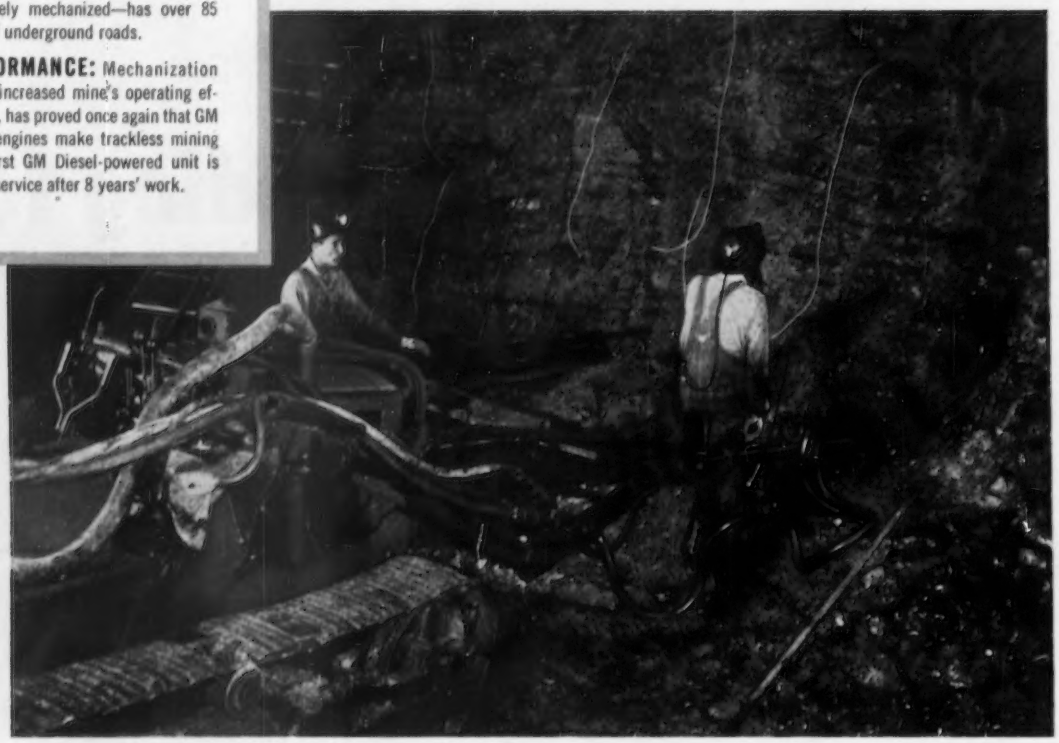
OWNER: Eagle-Picher Company, Miami, Oklahoma.

INSTALLATION: 50 GM Diesel-powered ore haulers, shovels, drills and personnel cars in zinc mine. Mine is completely mechanized—has over 85 miles of underground roads.

PERFORMANCE: Mechanization greatly increased mine's operating efficiency, has proved once again that GM Diesel engines make trackless mining pay. First GM Diesel-powered unit is still in service after 8 years' work.

8 years underground

and still going strong



TO A General Motors 2-cycle Diesel engine "home" is where the job is. That's why you'll find both underground and surface (strip) miners specifying GM Diesel power for their mines.

In the Eagle-Picher underground mine, GM Diesel engines equipped with exhaust scrubbers keep production on the move.

And in both deep mines and strip mines GM Diesels help move more tons at less cost. Their 2-cycle operation with power at every piston downstroke means faster acceleration, less time spent per haul trip or bucket swing. What's more, you can run a GM Diesel for a lifetime because all parts and components are easily replaced.

Eagle-Picher executives say the local GM Diesel distributor was "invaluable" in working out some of their power problems. Back of the low-cost performance of GM Diesels *everywhere* stands a network of distributors ready to give you service and fast delivery of low-cost parts. These GM Diesel distributors are power experts. Call the one nearest you today for details on GM Diesel power for your mine.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 30 to 300 H. P. Multiple Units . . . Up to 893 H. P.

VISIT GENERAL MOTORS POWERAMA Gala Celebration of 100 Million GM Diesel Horsepower—Lake Shore South, Chicago—Aug. 31st through Sept. 25th

HOW 1 tractor handles 8 jobs every 8 hours

8:00 A.M. Tournatractor cleans up around shovel in ore pit...

These on-the-job photos show how Tournatractor's 19 mph "run-about" ability can help you maintain steady production.

At this plant in the iron range in Minnesota, Tournatractor's main job is cleaning around the shovel. It uses normal waiting periods to maintain the rock dump... clean spillage at the crushing plant... feed material from surge pile to hopper. Tournatractor is also ready at a moment's notice to clear second-growth timber or to "lend a hand" when the crusher plant crew makes screen adjustments. In its spare time, Tournatractor builds and maintains haul roads, handles clean-up around the plant, improves drainage, cleans banks of washed-in spoil, levels for drill moves and set-up. It travels to each assignment, finishes it, gets back to the shovel FAST.

If *your* work includes a lot of widely-scattered dozing and hauling jobs—cleaning around shovels and at dumps, push-loading scrapers, plowing snow, or clearing land—you'll want to know more about Tournatractor. Let us show you how 1 of these tractors-on-rubber can do the work of 2 or 3 tractors-on-crawlers. Write or call soon!

8:48 Travels .4 mi. to crusher, cleans up drain spillage.

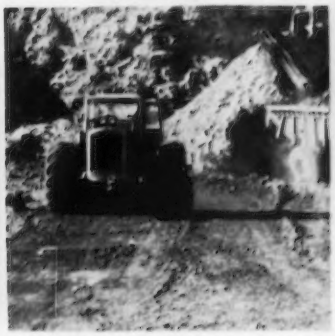
9:25 Runs .2 mi., and levels taconite-rock dump...

9:34 Returns .6 mi. to pit for more clean-up at the shovel.

11:45 Drives .4 mi. to help crew adjust screen at crusher.

11:55 Feeds material from surge pile to hopper at crushing plant.

12:20 P.M. Speeds .2 mi. back to rock dump for more leveling...



12:25 Drives .6 mi. to pit, cleans up again around shovel...

3:45 Goes .4 mi. to surge pile, feeds hopper. Next shift, 4:00 to 12:00.

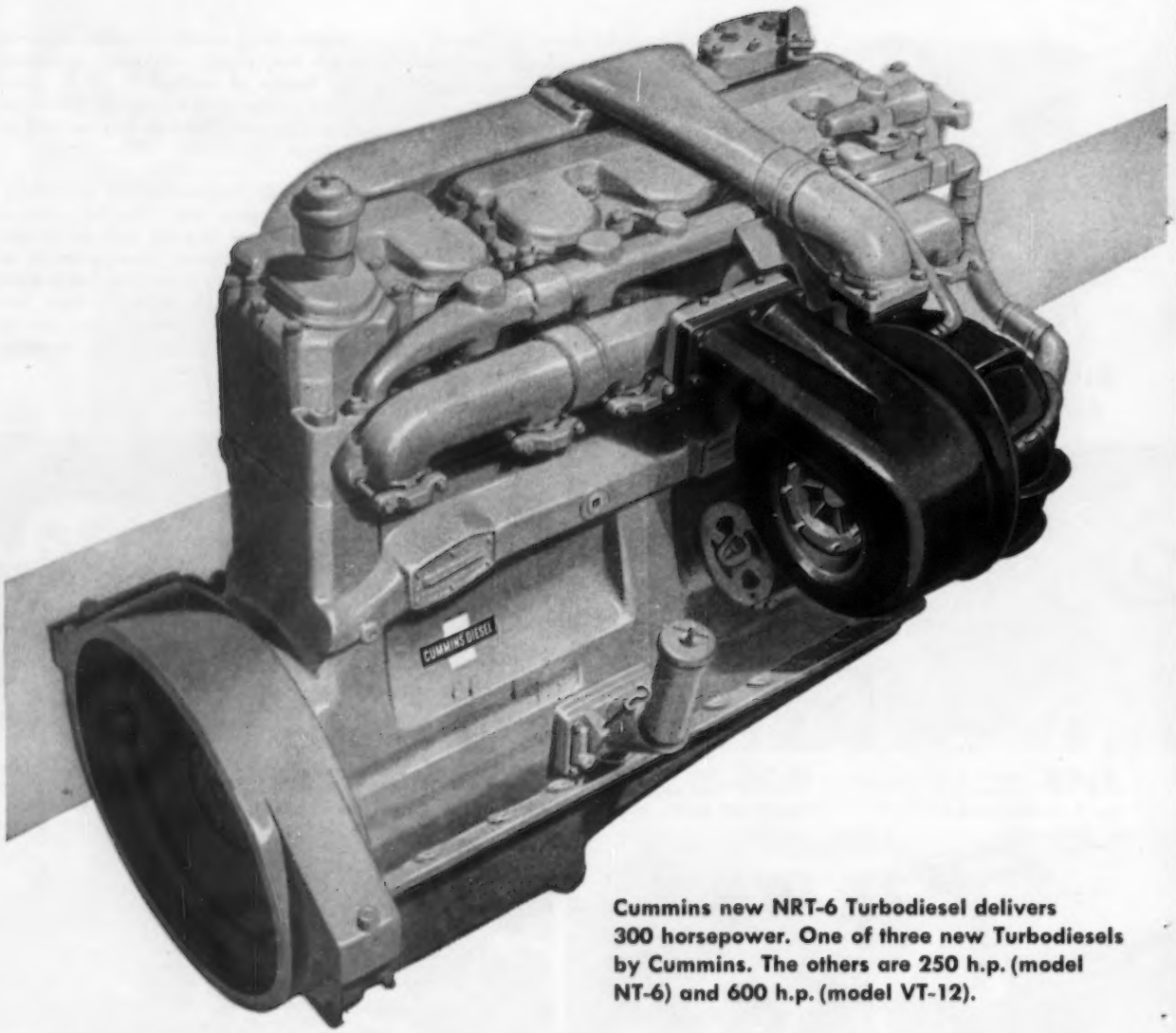
Tournatractor—Trademark Reg. U.S. Pat. Off. T-695-G-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

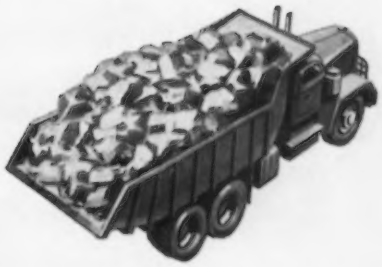
A Subsidiary of Westinghouse Air Brake Company

NEW TURBODIESEL



Cummins new NRT-6 Turbodiesel delivers 300 horsepower. One of three new Turbodiesels by Cummins. The others are 250 h.p. (model NT-6) and 600 h.p. (model VT-12).

BY CUMMINS



ups your production

and lowers your costs!

Cummins 300 h.p. turbocharged NRT-6 pulls full loads faster, permits higher speeds on grades, cuts cycle time, because it produces greater horsepower without increase in engine size or displacement.

Turbocharging—which harnesses exhaust gases normally wasted—produces this extra horsepower by achieving a more perfect air-fuel mixture in the combustion chamber. There is no parasitic load as in supercharged engines. This means drastically reduced fuel costs . . . fewer internal stresses . . . longer engine life.

In addition, Cummins exclusive PT fuel system is simple and trouble-free . . . makes fuel system maintenance costs negligible. It is so easy to understand and work with that no specialists are needed. And all Cummins Diesels run on inexpensive No. 2 diesel fuel or furnace oil.

For further information, see the Cummins distributor in your area, or send us this coupon today.

CUMMINS

Cummins Engine Company, Inc.
Columbus, Indiana

Leader in rugged, lightweight, high-speed diesels (60-600 h.p.)

Cummins Engine Company, Inc.
Columbus, Indiana

Please send me detailed information on Cummins new NRT Turbodiesel.

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Company_____

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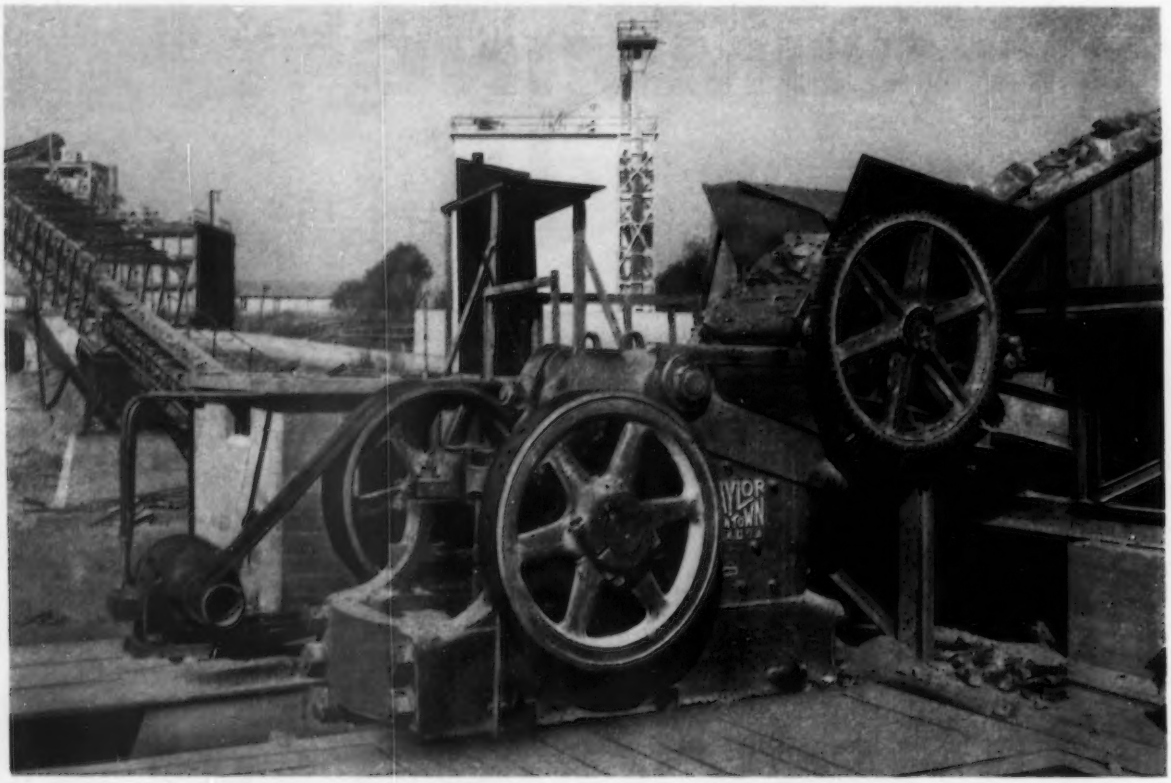
City_____ Zone____ State_____

EM-9



A Traylor all-steel jaw crusher puts the "break" on high costs

Making a profit today depends largely on how effectively you can control production and maintenance costs. Traylor All-Steel Jaw Crushers provide mining men with positive control on both counts.

Traylor All-Steel Jaw Crushers are designed and built with the knowledge gained over 50 years of field experience. They feature the massive construction needed for year 'round, heavy-duty, maintenance-free primary breaking. With Traylor's original curved jaw plates, choking and packing in the crusher are virtually eliminated by the increased capacity of each succeeding feeding zone in the crushing chamber. Designed to wear evenly over all, Traylor Curved Jaw Plates outwear conventional plates often by as much as 3 to 1.

Traylor All-Steel Jaw Crushers are available in five types with feed openings ranging from 8″ x 12″ up to 60″ x 84″. Write for free Bulletin containing complete descriptions, illustrations and specifications.

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SALES OFFICES: New York • Chicago • San Francisco
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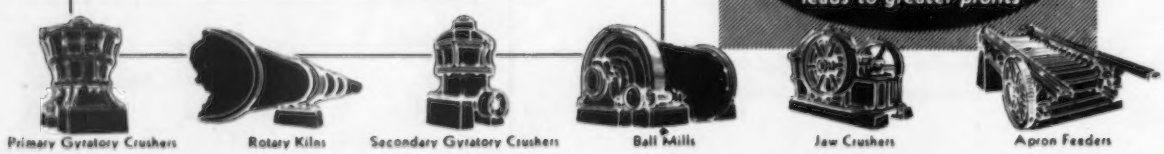
A Traylor leads to greater profits

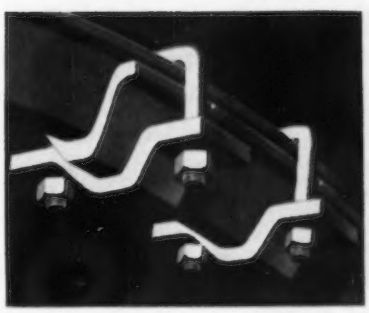


Primary Gyratory Crushers | Rotary Kilns | Secondary Gyratory Crushers | Ball Mills | Jaw Crushers | Apron Feeders

Steel Arch Offers New Kind of Safety Underground

Framing these men as they push the completion of a new ore mine is Bethlehem's Yieldable Arch for mine-roof control. It is especially designed to give rather than deform under excessive pressures. This allows the surrounding strata to stabilize naturally, and contributes to safety underground.

The yielding action takes place at sliding joints, where the nestable segments are joined to form the arch. The drawing at right illustrates how the rolled U-shaped segments nest at points of overlap. Studs on the sides of the segments locate the clamps and keep them positioned as the arch begins to yield.



Husky U-bolt clamps make the connections tightly enough to support normal loads. But when the load on the arch increases, the joints will yield, thus relieving the load while maintaining the structural integrity of the arch.

Horizontal struts and J-bolt clamps tie the arches together and provide lateral rigidity to the structure. Timber lagging may be used if desired, or steel lagging can be furnished.

The Yieldable Arch can be installed by your own men with minimum supervision, and it can be taken down and re-used time and again. It should pay for itself in its first year of operation. One of our engineers will be glad to discuss the Bethlehem Yieldable Arch and its advantages in detail with you. Just say the word.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Quebec's new cement plant chose WILFLEY SAND PUMPS

for GREATER DOLLAR SAVINGS IN OPERATING and MAINTENANCE COSTS

The Wilfley Pumps shown here are a cost-reducing factor of major importance in the huge, $13,000,000 wet-process plant at Quebec City. This installation is typical of the highly efficient job Wilfley Pumps are doing in modern cement plants throughout the world. Actual production-line records prove that Wilfley Pumps reduce operating costs, increase production and deliver trouble-free performance. Let Wilfley solve your pumping problems. Individual engineering on every application. Write or wire for complete details.

Wilfley Acid Pump

"COMPANIONS IN ECONOMICAL OPERATION"

Wilfley Sand Pump

A. R. WILFLEY and SONS, INC.

Denver, Colorado, U.S.A. • New York Office: 1775 Broadway, New York City

ENGINEERING AND MINING JOURNAL

SEPTEMBER 1955

Why All the Interest in Lithium?

FOR THE PAST FIVE YEARS an undercurrent of interest in lithium has been growing. Increased reader inquiries on this subject, and much talk in business circles indicate that this interest has expanded considerably during recent months. So in response to this interest, *E&MJ* staff members have gone all out to survey the lithium industry. What they found out appears in the articles starting p 75.

Information in these articles is based upon many personal interviews with the best informed people in the lithium industry—men who have helped build up the industry to its present status.

By way of a quick review, it might be cited that domestic lithium mineral production has increased from about 2,000 tons per year in 1940 to 27,240 tons in 1953. Industry expansion continues. Government demand siphoned off lithium production during World War II for use in sea rescue equipment and other military requirements. But when these were filled, and Government demand ceased abruptly in 1945, the lithium industry had to struggle to recoup commercial markets lost because of military requirements. The graph p 82 shows how effectively the lithium industry recovered.

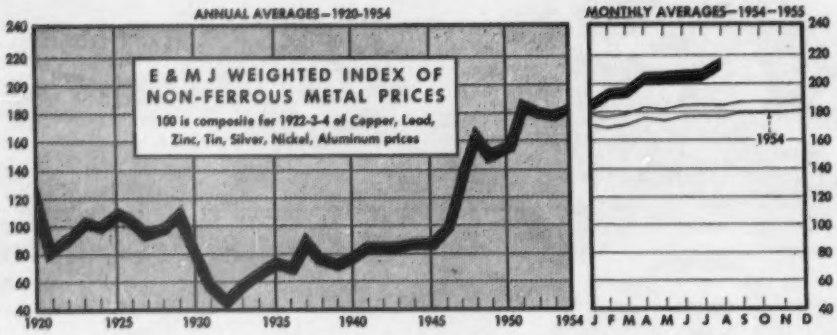
Growth of the lithium industry is due chiefly to the many versatile applications of lithium and its compounds in industry. Scientists and researchers say that they are just beginning to find out new applications. So assuming that the researchers will continue to expand lithium uses, and the industry will continue its adeptness at developing markets, one can look forward to a healthy expanding lithium industry based upon peacetime industrial applications alone.

As an example of lithium's versatility, consider the part which lithium is reported to play in the fusion process and the H-bomb. This is not a new revelation. *E&MJ* reported on this possibility in January 1951 based on unclassified scientific information. While it is premature to speculate on the use of lithium in the so called "controlled fusion" process which exploded into comment at the recent Geneva conference (see press comments p 89), this aspect may enhance the future of lithium. However any clarification will naturally have to come from the Atomic Energy Commission. In certain reactions, lithium and its compounds are capable of releasing tremendous energy which indicates some interesting applications in fields where high energy-packing fuels are required.

However despite any intriguing potential applications which lithium may have because of its versatility, current appraisal of the industry should be based upon facts such as those presented in the article starting p 75.

E&MJ OUTLOOK

PRICES



MARKETS

Demand for copper will continue to exceed supply during September and October, and the price could move even higher unless producers again obtain control of the market. All major producers moved to 43c by September 1, a record high since the Civil War.

The copper price jump was the chief factor in pushing *E&MJ*'s price index from 209.8 in July to 217.57 in August. Higher wages put aluminum and magnesium prices up. Lead, zinc and nickel were unchanged.

●

AT HOME

AEC is looking for more high-purity zirconium and hafnium metal. Zirconium is a low neutron absorber, and good for reactor construction. Hafnium is a high neutron absorber and good for control rods.

Tantalum is the lightest element known to be capable of fission, but tantalum fission is much more difficult to achieve than the fission of plutonium-239, uranium-233, or uranium-235. The corrosion rate of tantalum in sulphuric, nitric and hydrochloric acids is virtually nil.

If interested in taking over the Texas City tin smelter, write to the Office of Tin, Federal Facilities Corp., 811 Vermont Ave. N. W., Washington, D. C. Final decision whether to lease or sell the plant to private operators rests with Congress.

Primary Aluminum expansion forges ahead. Reynolds plans to increase primary aluminum capacity by 135,000 tons, and Alcoa by 15,000 tons.

If consumer credit gets out of hand, the McGraw-Hill Economics Department observes that the Federal Reserve "must try to slow down the boom without killing it, an extremely delicate operation."

Consumers are shopping for bargain prices, so much so that Westinghouse has decided to discontinue its fair trade pricing policies. Purchasing agents report that competition is "razor-keen" at the industrial level on most manufactured items. These evidences of a buyer's market eventually will have an impact on primary metal prices.

●

LABOR

It may take several years before the Attorney General can get a final verdict on his charges that Mine-Mill is dominated by Communists in control of a foreign power. See p 119.

●

ABROAD

Aluminum Company of Canada has ordered a 3-mile conveyor to move sand and gravel for new construction and plant expansion at Kitimat.

Copper trading at high prices in the London Metal Exchange reflects in part covering there against sales made in the United States.

Greatest fear in the copper industry is not that copper will be in short supply, but that labor problems in Africa, and inflation problems in Chile may further interrupt production.

Copper Advances Sharply as World Shortages Continue—Strikes End

COPPER REALLY WENT to town during August and there was not a dull moment in the market for nonferrous metals throughout the month. The costly strikes in the domestic copper industry ended but the shortages in the available supply of the metal created by the work stoppages are likely to continue for several months unless moderating influences come into the picture from some unexpected quarter. The scramble for copper by consumers without regard for price was without precedent. So far, a general tightening in credit terms and a reduced rate of activity in the automobile industry failed to check the over-all demand for raw materials. The "inflationary" wage boosts granted this year apparently offset all other factors in supporting the price structure.

The only dark spot on the horizon, according to the August report of the National Association of Purchasing Agents, is the upward spiral in prices in the face of increasing competition in most manufactured items. Competition in finished products was described as "razor keen." Price shading, even in items tied to copper, has been widespread.

Copper, aluminum, magnesium, antimony, foreign silver and selenium advanced in price during August. The "sensational" rise in copper was largely responsible for a sharp upturn in the *E&MJ* index of nonferrous metal prices to the all-time high of 217.57. A year ago the index stood at 184.65. Tin and quicksilver averages for the month were lower.

Industrial production for August, seasonally adjusted, was at 140% (preliminary) of the 1947-49 base period, according to the index of the Federal Reserve. This compares with 124% in August a year previous.

Soon as strikes in the copper industry ended around mid-August, after the loss of more than 80,000 tons of production at the mines, strong upward pressure on prices abroad and here caused the domestic market to rise by 4c per pound to the basis of 40c per pound, delivered. The rise was gradual, with Anaconda taking the initiative. This marks the highest price named by producers since the Civil War period.

Demand for copper was such that some fabricators here purchased metal in the European market for shipment to the U. S. at 50c per pound and higher. Scrap sold here at prices considerably above the basis at which producers were sellers of primary metal. In London, on August 30, cash copper advanced to £400 per long ton asked, equivalent to 50c per pound. Speculators were caught in the squeeze and sustained heavy losses. With copper prices substantially above the cost of production, various producers have been resisting the rise ever since copper moved above 30c. They naturally were concerned over the future of the metal.

Chile, in the throes of an inflationary spiral that has sent the peso in the free market to as high as 840 to the dollar, has been pressing for more and more revenue from copper producers to stem the rising tide. Officials in that country threatened to take action if producers failed to lift their prices and take full advantage of the situation. A strike of Government workers in Chile created uncertainty over maintaining the flow of copper out of that country. President Ibanez, late in the month, asked for authority to declare a state of siege to restore order.

Another rise in the price started as soon as it became known that a custom smelter sold fairly large tonnages of copper in the domestic market at 50c per pound. Anaconda raised its selling basis on August 26 to 43c per pound. Phelps Dodge followed on August 29, but Kennecott took no action until Sept. 1. Most other sellers moved up their prices soon after Anaconda announced its change.

Floods in the Connecticut area, the aftermath of a tropical hurricane, crippled production at brass and wire mills to the extent that production losses amounted to between 20 and 40%. The losses in the area would have been greater except for available capacity in other sections of the country.

Aluminum advanced in price by 1c per pound on pigs and 1.2c on ingots to absorb higher costs under new wage agreements. Despite record production, the supply situation in aluminum was tight.

Refined lead production was set back by strikes, but foreign metal was available in the emergency and the price situation remained about unchanged. The GSA again asked for lead for the stockpile, largely a gesture "to keep the pot boiling."

Zinc smelters were all set to raise the price on the strength of developments in

Summary of Copper Statistics—Copper Institute

Production, deliveries and stocks of copper in the United States and outside of the United States, as reported by Copper Institute, figures in short tons.

United States

Production:	Jan.	Feb.	March	April	May	(b)June	July
Crude, primary	86,931	89,078	98,171	93,669	95,042	90,645	31,814
Crude, secondary	8,879	13,264	10,239	10,559	11,731	11,295	7,607
	95,810	102,342	108,410	104,228	106,773	101,940	39,421
Refined copper	123,840	123,162	135,701	122,129	135,042	130,881	51,182
Deliveries, refined (a)	113,949	108,503	131,354	119,863	124,853	132,730	60,143
Stocks, refined	45,982	44,579	46,091	42,759	43,340	38,533	36,293

Outside United States

Production:	Jan.	Feb.	March	April	May	(b)June	July
Crude, primary	109,582	114,260	133,530	137,567	134,732	141,413	135,751
Crude, secondary	350	208	319	283	574	603	765
	109,932	114,468	133,849	137,850	135,306	142,016	136,516
Refined copper	85,743	89,661	101,825	102,396	116,749	109,654	108,317
Deliveries, refined	113,035	116,752	103,764	101,552	108,924	115,719	89,500
Stocks, refined	159,296	144,337	148,973	158,076	176,620	171,412	183,350

(a) Includes tonnages delivered from Government stocks; also includes imports of foreign copper for account of Copper Institute members and others. (b) Corrected.

Average Prices for August (E&MJ Quotations)

Copper:	
Electrolytic, domestic refinery	38.150
Electrolytic, export, refinery	43.009
Lead:	
Common, New York	15.000
Common, St. Louis	14.800
Silver and sterling exchange:	
Silver, New York, per oz.	90.750
Silver, London, pence per oz.	79.119
Sterling Exchange, "Checks"	278.665
Zinc:	
Prime Western, East St. Louis	12.500
Prime Western, delivered (g)	13.000
Tin:	
New York Straits	96.458
New York, 99% min. (e)	95.458
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$253.889
Antimony (E&MJ) (d)	34.137
Antimony, bulk, Laredo	30.667
Antimony, in cases, Laredo	31.167
Platinum, refined, per oz.	$84.000
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus ingot	24.333
Magnesium, ingot	30.574
Nickel (f)	64.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

MARKETS

copper. Demand here was active and the price strong. However, an unresponsive European market kept prices here in check.

Tin eased as tension over political changes in Malaya moderated. The U. S. Government has indicated that it would like to sell the Texas City smelter to private industry. August was a month of little or no progress in so far as the International Tin agreement was concerned.

Manganese ore was higher on improved demand and a high freight market. Tungsten ore steadied on moderate offerings. Prices on the lower grades of chrome were unsettled.

Quicksilver was unsettled most of the month but recovered moderately before the close on reduced offerings.

"Free" Gold Market

Trading volume in "free" gold declined during August. Illegal trading in coins increased in satellite countries. Fluctuations were narrow in most western European countries. Demand increased in France. Prices were strong in North Africa and Asia. Chile listed high gold coin prices. Pick's World Currency Report quotes on "free" gold, per fine oz, as follows:

	COINS		BARS (12.5 kg)	
	July 30	Aug. 31	July 30	Aug. 31
NEW YORK, transit	.....	.....	$35.10	$35.10
MANILA	$39.25	$39.00	36.40	36.40
HONG KONG	39.50	39.60	37.85	37.75
BOMBAY	53.50	54.00	52.75	53.25
TANGIER	38.75	38.90	35.05	35.03
BEYROUTH	39.65	39.60	35.18	35.16
PARIS	39.80	40.45	35.90	35.80
BUENOS AIRES	43.00	42.75	38.60	37.50

Note: Prices are computed at the free or black market value of the U.S. dollar in the local markets

Major Metals

U. S. DAILY AND AVERAGE PRICES

Aug. 1955	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis
1	35.700	36.675	97.500	15.000	14.800	13.000	12.500
2	35.700	38.600	97.375	15.000	14.800	13.000	12.500
3	35.700	39.050	97.375	15.000	14.800	13.000	12.500
4	35.700	39.775	97.375	15.000	14.800	13.000	12.500
5	35.700	38.625	97.125	15.000	14.800	13.000	12.500
6	No Market	38.275	97.125	15.000	14.800	13.000	12.500
8	35.700	39.625	96.875	15.000	14.800	13.000	12.500
9	35.700	38.700	96.750	15.000	14.800	13.000	12.500
10	35.700	38.125	96.625	15.000	14.800	13.000	12.500
11	35.700	39.625	96.250	15.000	14.800	13.000	12.500
12	35.700	37.175	96.250	15.000	14.800	13.000	12.500
13	No Market	37.175	96.250	15.000	14.800	13.000	12.500
15	35.700	39.225	96.375	15.000	14.800	13.000	12.500
16	35.700	38.700	96.625	15.000	14.800	13.000	12.500
17	37.050	39.225	96.750	15.000	14.800	13.000	12.500
18	39.700	41.175	96.250	15.000	14.800	13.000	12.500
19	41.425	41.375	96.250	15.000	14.800	13.000	12.500
20	No Market	41.375	96.250	15.000	14.800	13.000	12.500
22	40.125	40.550	95.875	15.000	14.800	13.000	12.500
23	40.200	41.475	96.125	15.000	14.800	13.000	12.500
24	41.425	41.800	96.250	15.000	14.800	13.000	12.500
25	40.650	41.750	96.000	15.000	14.800	13.000	12.500
26	40.925	43.150	95.875	15.000	14.800	13.000	12.500
27	No Market	40.800	95.875	15.000	14.800	13.000	12.500
29	42.525	42.600	95.750	15.000	14.800	13.000	12.500
30	42.500	42.575	95.625	15.000	14.800	13.000	12.500
31	42.525	43.050	95.625	15.000	14.800	13.000	12.500
AVERAGES FOR MONTH							
Aug.	38.150	40.009	96.458	15.000	14.800	13.000	12.500
AVERAGES FOR WEEK							
Aug.							
3	35.700	37.679	97.521	15.000	14.800	13.000	12.500
10	35.700	38.854	96.979	15.000	14.800	13.000	12.500
17	35.970	38.521	96.417	15.000	14.800	13.000	12.500
24	40.575	41.292	96.167	15.000	14.800	13.000	12.500
31	41.825	42.321	95.792	15.000	14.800	13.000	12.500
CALENDAR WEEK AVERAGES							
Aug.							
6	35.700	38.500	97.313	15.000	14.800	13.000	12.500
13	35.700	38.404	96.500	15.000	14.800	13.000	12.500
20	37.915	40.179	96.417	15.000	14.800	13.000	12.500
27	40.665	41.588	96.000	15.000	14.800	13.000	12.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Aug. 1955	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	278.8125	90.750	Holiday	Holiday	$35.00
2	278.9375	90.750	79.250d.	251s. 3¾d.	35.00
3	278.8854	90.750	79.250d.	251s. 1½d.	35.00
4	278.7946	90.750	79.250d.	251s. 2d.	35.00
5	278.7232	90.750	79.250d.	251s. 3d.	35.00
6	(e)	(e)	(e)	(e)	35.00
8	278.7500	90.750	79.250d.	251s. 3d.	35.00
9	278.7500	90.750	79.250d.	251s. 2½d.	35.00
10	278.7098	90.750	79.250d.	251s. 3¼d.	35.00
11	278.6696	90.750	79.250d.	251s. 5d.	35.00
12	278.5625	90.750	79.250d.	251s. 5¾d.	35.00
13	(e)	(e)	(e)	(e)	35.00
15	278.5937	90.750	79.250d	251s. 6d.	35.00
16	278.6250	90.750	79.250d.	251s. 5¾d.	35.00
17	278.6875	90.750	79.250d.	251s.4¾d.	35.00
18	278.6250	90.750	79.250d.	251s. 5½d.	35.00
19	278.5669	90.750	79.125d.	251s. 5½d.	35.00
20	(e)	(e)	(e)	(e)	35.00
22	278.6071	90.750	79.000d.	251s. 5¼d.	35.00
23	278.6116	90.750	79.000d.	251s. 5¼d.	35.00
24	278.7008	90.750	78.875d.	251s. 5d.	35.00
25	278.6473	90.750	78.875d.	251s. 4d.	35.00
26	278.5580	90.750	78.875d.	251s. 4d.	35.00
27	(e)	(e)	(e)	(e)	35.00
29	278.4685	90.750	78.875d.	251s. 4¾d.	35.00
30	278.5000	90.750	78.875d.	251s. 4¾d.	35.00
31	278.5000	90.750	78.875d.	251s. 4¾d.	35.00
AVERAGES FOR MONTH					
Aug.	278.665	90.750	79.119	—	35.00
AVERAGES FOR WEEK					
Aug.					
3	278.854	90.750	—	—	—
10	278.746	90.750	—	—	—
17	278.628	90.750	—	—	—
24	278.622	90.750	—	—	—
31	278.535	90.750	—	—	—

Calendar Week Averages: New York Silver: Aug. 6th, 90.750; 13th, 90.750; 20th, 90.750; 27th, 90.750.
(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent. Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.50c.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

London Metal Exchange Quotations

Aug.	COPPER Cash Bid	COPPER Cash Asked	COPPER 3 Mo. Bid	COPPER 3 Mo. Asked	LEAD Current Month Bid	LEAD Current Month Asked	LEAD 3 Mo. Bid	LEAD 3 Mo. Asked	ZINC Current Month Bid	ZINC Current Month Asked	ZINC 3 Mo. Bid	ZINC 3 Mo. Asked	TIN Cash Bid	TIN Cash Asked	TIN 3 Mo. Bid	TIN 3 Mo. Asked
1	Holiday															
2	359	360	351	352	107¾	108	107¼	107½	90¼	90½	90½	90¾	760	761	753	754
3	360½	361	353	353½	107¾	108	107	107¼	90¾	91	91	91¼	763	765	757	757½
4	368½	369½	361	363	107¾	108	107¼	107½	90½	90¾	90¾	91	763	764	757½	758
5	363	364	355	356	106½	107	106¼	106½	90	90¼	90¼	90¾	757	758	751	751½
8	352	352½	346½	347½	105¾	106	105¼	105½	89	89¼	89¼	89½	748	750	743	745
9	360	361	355	356	106	106¼	105½	105¾	89¾	90¼	90	90¼	753	754	748	748½
10	359	361	353	354	105½	105¾	105	105¼	89¼	89½	89½	89¾	750	752	745	746
11	357½	358½	351	352	104¾	105	104½	104¾	88½	89	88¾	89	747½	748½	742½	743
12	357	358	351	351½	104¾	105	104¼	104½	88¾	89	89	89¼	750	751	745½	746
15	358½	359½	351½	352	104¾	105¼	104½	104¾	88¾	89¼	89	89½	750	751	745½	746
16	361	362	351½	352	105	105¼	104½	104¾	89	89½	89	89½	752	753	747½	748
17	371	373	356	357	105¾	106	105¼	105½	89¼	89½	89¼	89½	755½	757	751	752
18	374	376	361	362	106¼	106½	105¾	106	89	89¼	89	89¼	751	752	748	749
19	378	379	365	366	106½	107	106	106½	89½	89¾	89½	89¾	749½	750	747	747½
22	374½	375	367	368	106½	106½	105¾	106	89½	89½	89½	89½	748	749	746	747
23	377½	378	370	370½	106½	106¾	105¾	106	89½	89¾	89½	89¾	749	751	747	748
24	380	381	372	372½	107	107¼	106	106¼	89¾	90	89½	89¾	750	751	749	749½
25	371	371½	364½	365	106¾	107	105¾	106	89¾	89½	89¼	89½	747	748	747	748
26	382	383	376	377	107	107¼	106	106¼	89½	90	89½	89¾	747¾	748	747½	748½
29	392	394	388	389	107	107½	106¼	106¾	90	90¼	89¾	90	746½	747	746½	47¼
30	399	400	394	395	107¼	107½	106¾	107	90¼	90½	89¾	90	745	745½	745½	746
31	393	393¼	386½	387	107	107¼	106¾	107	90	90¼	89¾	90	745¼	746	745½	746
Av'g's	£370.886		£363.136		£106.494		£105.920		£89.710		£89.716		£751.824		£748.364	

Prices are for the official a.m. session in pounds sterling per ton. Copper basis wire bars, lead 99.97%, zinc 98% and tin min. 99.75%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb unless otherwise noted.

MISCELLANEOUS METALS

Aug. 31, 1955

Aluminum ingot, 99 plus % lb			24.4¢
Antimony, spot, lb, less than carload, in cases			36.47¢
In bulk, carload lots, f.o.b. Laredo			33.00¢
Bismuth, ton lots, lb			$2.25
Cadmium, commercial sticks, delivered, lb			$1.70
Calcium, lb, ton lots, 98%, cast			$2.00
Chromium, 97% grade, lb, contract			$1.18
Cobalt, 9 to 99%, per lb			$2.60
Germanium, lb			$295.00
Indium, troy oz			$2.25
Lithium, lb, 98%	$11.00	@	$12.00
Nickel, cathodes, lb, f.o.b. Port Colborne (a)			64½¢
Magnesium, 99.8%, carloads, lb, producer's plants, Freeport, Texas			32½¢
Palladium, troy oz	$22.00	@	$24.00
Platinum (wholesale lots) troy oz	$80.00	@	$90.00
Quicksilver, flask of 76 lb, 25 flasks or more	$255	@	$257
Selenium, 99 plus %, lb	$9.00	@	$10.00
Silicon, minimum 97%, carloads, lb			18¢
Tellurium, lb			$1.75
Thallium, 100 lb or more, lb			$12.50
Titanium, 99.3 plus, grade A, max. 3% iron, lb (a)Includes U. S. duty.			$3.95

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$36.00	@	$38.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:			
44% Cr_2O_3 no ratio	$22.00	@	$23.00
48% Cr_2O_3 3 to 1 ratio	$43.00	@	$53.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:			
Old Range bessemer			$10.40
Mesabi bessemer			$10.25
Mesabi, non-bessemer			$10.10
Lead (Galena), 80%, Joplin, Mo., ton			$187.85
Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties 98¢ @ $1 c.i.f. U. S. ports, duty extra. Long-term contract nominal at 94 @ 96¢ c.i.f. duty extra.			
Molybdenum Ore, 90%, per lb of Mo f.o.b. mines			$1.05
Columbium-Tantalum, per lb. combined oxides			(a)
Tungsten Ore, per unit of WO_3:			
Foreign 60%, c.i.f. U. S. ports, duty extra	$33.50	@	$34.00
Domestic, scheelite, 60% f.o.b. mill			$63.00
Vanadium Ore, per lb of contained V_2O_5 f.o.b. mines			31¢
Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton (a) Nominal.			$76.00

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb, in bbl carload lots delivered			5½¢
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb	$1.96	@	$1.97½
Copper Sulphate, 100 lb			$13.50
Germanium Oxide, lb			$142.00
Molybdic trioxide, technical, per lb of Mo	$1.24	@	$1.25

ALLOYS

Ferrochrome 65 to 69%, per lb of Cr. (4–9% C)			24½¢
Ferromanganese, 74–76%, net ton, seaboard			$190
Ferromolybdenum, 55 to 65% Mo, lb of Mo contained	$1.49	@	$1.57
Ferrosilicon, 50% per lb of contained Si			12¢
Ferrotungsten, 72 to 82%, lb of W contained			$3.45
Ferrovanadium, per lb of V delivered	$3.00	@	$3.25
Silicomanganese, max. 1½% carbon, lb, contracts			11¢
Spiegeleisen, per long ton, 19 @ 21% grade			$86.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:			
Crude No. 1	$960	@	$1,500
Crude No. 2	$595	@	$900
Spinning fibers	$321	@	$514
Shingle fibers	$150	@	$200
Paper stock	$109	@	$137
Waste			$77
Shorts	$35	@	$70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):			
Spinning fiber, 3-K			$460
Shingle fiber, 4-K			$185
Asbestos, Vermont, f.o.b. Hyde Park:			
Spinning fibers	$279.50	@	$302.00
Shingle stock	$135.00	@	$162.00
Paper stock	$81.50	@	$115.00
Waste, stucco or plaster			$71.40
Refuse or Shorts	$34.00	@	$63.00
Barytes f.o.b. cars:			
Georgia, crude, per ton			$15.00
Missouri, 94% $BaSO_4$, per short ton			$13.25
Bauxite, long ton, f.o.b. point of shipment:			
Domestic crude, 50 to 52% (not dried)	(a)$5.00	@	$5.50
Domestic, chemical, 55 to 58%	(a)$8.50	@	$9.05
Domestic, abrasive, 80 to 84%	(a)$18.00	@	$18.50
Feldspar, bulk ton:			
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50	@	$22.25
Glass feldspar, white, 20 mesh	$11.75	@	$12.50
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$32.00	@	$33.00
60% effective CaF_2	$26.50	@	$28.00
Acid 97% concentrate, bulk, ton			$47.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00	@	$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$38.00
Mica—Domestic, f.o.b mines. Punch 12 to 22¢ per lb according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to 85¢; 2 x 2 inch, $1.10 to $1.60; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap $25 and up.			
Ocher, Georgia, ton, in sacks	$26.50	@	$30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports			Not quoted
Sulphur, Texas, mines, long ton	$25.50	@	$27.50
Talc, f.o.b. works ton			
New York, purified	$18.50	@	$20.00
Vermont, extra white			$13.50
Tripoli, Missouri, ton:			
40-mesh, cream colored (a) Nominal.			$30.00

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces			$58.50
Steel f.o.b. Pittsburgh, billets, net ton			$68.50
Structural shapes, Pa., Ala. etc., 100 lb			$4.50

TRIPP PIT of Consolidated Coppermines Corp. has a reserve of some 25-million tons. Pit is 3200 ft long, 1700 ft wide, will be mined at a rate near 7,000 tpd of ore. Neighbor to Kimberly properties, new operation is named for president of CCC.

Kennecott, Coppermines Open New Pits

WHITE PINE COUNTY, Nevada is witness to great activity in copper mining. With the end of the recent strike, both Kennecott Copper Corp.'s Nevada Mines division and Consolidated Coppermines Corp. are launching expanding mining operations.

Nevada mines will begin production from its 20-million ton orebody, now stripped and exposed, at the Veteran pit, presently scheduled to be second (to the Liberty pit) largest open pit in Eastern Nevada. Nevada Mines will also begin underground development of the Minnesota Hi orebody at Deep Ruth. (See *E&MJ*, March 1955, p 118.)

Meanwhile, mining will begin immediately on the Consolidated Coppermines Corp. open-cut Tripp pit, named for Chester D. Tripp, company president. With estimated ore reserves at 20- to 25-million tons, the Tripp is assured of profitable operation for another 10 to 12 years. Present plans call for move-

CLOUDS OF DUST from Tripp pit signify activity of new trucks and shovels which must move an estimated 50-million tons.

ment of 7,000 tpd daily.

When fully developed, Tripp will cover an area 3200x1700 ft wide. Fourteen Euclids and three P&H shovels have been purchased to move the estimated 50-million tons of ore and waste.

At the Veteran pit, Isbell Construction Co. has spent two years moving 16.7-million tons waste from above the orebody. When opened, the Veteran will be 2450 ft long, 1500 ft wide and 850 ft deep. Old Veteran shaft of Cumberland-Ely Copper Corp. is located about dead center of the pit.

Kennecott will use 12 trucks, a P&H 6-yd and two 4-yd Bucyrus-Erie shovels, Tournadozer, D-8 Caterpillar, two 2½-cu yd Michigan loaders and rotary and churn drills. After removal of 13,000 tons of ore for test purposes, pit is now ready for mining of 168,000 tons more. After this is taken, mining will proceed in conjunction with required stripping of waste overburden.

Both companies stress that these new reserves will add greater life to the area, but will not result in any immediate or significant increase in copper production by the district.

No increases in production could be accomplished without significant increase in concentrator capacity at Kennecott's McGill reduction center, which handles milling and smelting of ore in the area.

For more pictures of the Kennecott and Tripp operations, see p 216.

Western Governors Mineral Conference Nov. 7-8

MINERAL POLICY CONFERENCE will be held in Sacramento to formulate and recommend fundamental national mineral policy. Result of preliminary work of Gov. Charles H. Russel, Nevada and Gov. Goodwin J. Knight, California, the conference is intended to create and maintain a healthy domestic mining policy in the interest of national security and general economy of the U. S.

Taxes, land and water, mineral economics, research and public information will be discussed in committee and subcommittee panels. Results of the conference will help formulate ideas and recommendations to the Governors Mining Advisory Council meeting scheduled for Nov. 9-10. All eleven western states, Alaska and South Dakota will be represented at the meetings.

Palmiet Chrome Mine Sold

STANDARD ORE & ALLOYS CORP., N. Y., purchased Palmiet Chrome Mine in Transvaal, Union of South Africa. Mine has reported capacity of 1,000 tons high grade chrome concentrate per month. Plans are to mechanize and increase output to 4,000 tpm.

As we went to press . . . . .

A discovery "that promises to rank among the great copper mines in the world" has been made by Anaconda Co. at its Indio Muerto property in Chile (See *E&MJ*, June 1955, p 72.)

Though specific information is not yet available, Anaconda officials told the Wall Street Journal that company engineers believe it will have as much tonnage as the Toquepala mine of Peru.

The company has reportedly already blocked out part of the orebody at Indio Muerto that would warrant mining operations within a relatively short time.

Treatment of ore from the new property presents no immediate problems, according to the New York business newspaper, because Indio Muerto is located only a short distance from Anaconda's Potrerillos plant. Potrerillos produces about 4,000 tons of refined copper per month, and the company expects it to continue at that rate for the next five or six years.

Other expansion plans for Anaconda properties discussed in a recently published news article revealed that output from the famous Chuquicamata mine will be increased; that expansion at the Butte Hill orebody is to be expanded tremendously.

Wage-pension settlements have been reached with the CIO United Steelworkers at the Kennecott Copper Corp. refinery and the American Smelting & Refining Co. smelter at Garfield, Utah.

AS&R's pact grants an across-the-board increase of 11.5c per hour to the smelter's 1,500 workers, with a half-cent increase in pay between job classes. Kennecott will pay a package increase of almost 16c per hour, including a hike which ranges from 11.5c for lower job classes to 20.5 for top grades. Pensions were also increased.

While no Sabre Uranium Corp. official will make an estimate of ore contained in the firm's section in McKinley County, 20 miles north of Grants, N.M., "other sources" have been quoted placing the tons already blocked out at 2-million.

Atomic Energy Commission plans to procure additional quantities of high-purity zirconium and hafnium metal, according to Lewis L. Strauss, chairman of AEC. Procurement will meet "the increasing requirements of" AEC's reactor development program and "of currently-scheduled Naval projects."

Proposals will be solicited for delivery of 2-million lb zirconium metal over a 5-year period or 1.2-million lb over a 3-year period.

Tunneling at Philippines' Mindanao Mother Lode vein showed results which exceed in grade and tonnage (by some 10- to 15%) earlier figures obtained by diamond drilling. A 400-ton mill will begin producing in about seven months. At full stoping capacity, mine ore recovery will run about 3% Cu. Diamond drilling also uncovered a second vein, "The Ditch," which now shows some 40,000 tons of 3% copper.

New Jersey Zinc Co. has started development work on its recently acquired Flat Gap property at Treadway, Tenn. Shaft sinking will begin this month. Trackless mining will be employed.

Behind the By-Lines . . .

G. P. Lutjen

For the first time anywhere this side of the AEC's secret files, you can get in this issue, the details of a process for precipitating uranium out of solution. Actually, the article, "Vitro's Keys to Successful Uranium Leaching" was already sewn up when word came through that the AEC had declassified information on uranium extraction. Skirting the edge of panic the editor preparing the story wired Vitro for details of that portion of the flowsheet. Quicker than you can say "phosphate precipitation" Vitro sent back the details of the process. Next problem: operating on the story to insert the vital details.

"Prepare the dummy for surgery," barked the editor, drawing on a pair of rubber gloves. An anxious group bent over the desk. "Scalpel" . . . "Scissors" . . . "Paste Pot" . . . "Anaesthetic" (for the copy editor who gets upset when things interfere with the schedule). Then suddenly the tension was released. The operation was over. The editor straightened up. "Send it to the printer," he said tersely.

We're pleased to note that the story has hardly any scar. It comes to you on p 100 and not as a stranger.

We took the plunge this month—an all-out, go-for-broke leap into the lithium situation.

It all started with a cryptic comment here and there falling on our outstretched ears, a few inquiries laced with studied casualness, and an increasing frequency of the word "lithium" appearing in our news reports from all over the world. We took the hint and Mike Eigo, Jim Franklin and George Cleaver of the staff began traveling around asking questions.

It was a tough assignment and the boys found themselves frequently wading hip-deep in "no comments" and contradictory information. But before long, a remark picked up in New York fitted in with an answer received in Washington. And a piece of information from Canada made sense when linked with a comment elicited in South Dakota.

The net result is the most complete published report on lithium available anywhere today. It starts on the next page. It is exciting reading with no wasted words; every sentence is significant.

We sincerely doubt that you can ask a question about lithium which is not answered in the Eigo-Franklin-Cleaver report. There's only one reservation to this statement. The U. S. Government has come to regard several developments in lithium as top secret and we can emphatically assure you that there are no security leaks anywhere when it comes to the people concerned with lithium. Even if we could, we wouldn't, in this lithium report, violate these security regulations, but you will never come closer to finding out about all the fascinating facets of lithium unless you have been "Q" cleared by the FBI—which we haven't been.

If it didn't involve a new 160,000-ton market for zinc, we wouldn't mention the word "biochemistry." But the third International Congress of Biochemistry at Brussels last month presented the zinc industry with its greatest opportunity since die casting. These research-mad biochemists have discovered that zinc is absolutely vital to the living process. To wax technical, it's an essential element in carboxypepditase and alcohol hydrogenase. The former is a ferment present in the pancreas, a gland well-known for its production of insulin and other vital juices. Alcohol hydrogenase has an important, indispensible role in the respiratory system.

Linking this scientific information with a high powered advertising program would be in the finest American tradition. In no time, every man, woman and child in the United States would be made painfully aware of the need to consume at least 2 lb of zinc a year to maintain health at a reasonably attractive level. A little simple arithmetic—which is the best kind—reveals that the U. S. population of 160-million would require 160,000 tons of zinc a year for the medicine chest alone. And this is only the beginning.

The record shows that with a little competent **huckstering via press, radio and television, zinc can be** right up there with Davey Crockett. (After all, who could kill a b'ar when he was only three without a pancreas full of zinc?)

Cigarettes will be rounder, firmer and more fully packed with zinc dust when the public becomes aware of recent tests showing that the danger of cancer in persons smoking zinc is reduced by 97%, 3% of the time.

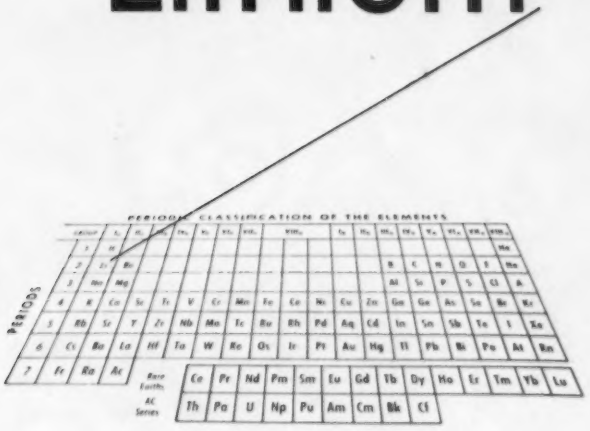
Mothers everywhere will be demanding Zincopated toothpaste. If we don't get them on a carboxypeptidase deficiency scare, we'll point out with all the unsubtlety we can muster, that what galvanizing does for steel, Zincopated dentrifice will do for teeth. This logic compares favorably with that displayed in current advertising and just for good measure, the billboards will show a kindly old dentist saying, "Show me a child with galvanized teeth and I'll show you a conscientious mother."

The "More Zinc for Better Health" approach can be applied to many fields, cosmetics, beer and athlete's foot, to name a few. Of course, the campaign will cost money but think what it will do for the health of the nation! Think what it will do for the health of the zinc industry! Even now we can hear the first singing commercial to the tune of "Twinkle, Twinkle, Little Star":

"If you're run down, on death's brink,
Dash right out and buy more zinc."

Our old beachcomber friend writes that he has given up making mental bets at the track. He went out one day last week and lost his mind.

Lithium


PERIODIC CLASSIFICATION OF THE ELEMENTS
PERIODS
Rare Earths
AC Series
Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
Th Pa U Np Pu Am Cm Bk Cf

Daniel P. Eigo, news editor
James W. Franklin, assistant editor
George H. Cleaver, assistant editor, markets

A FIRST CLASS MYSTERY seemed to be developing around lithium some months ago.

For one thing, a sporadic trickle of inquiries on the lightest known metal developed into a flood of telephone calls, letters and even telegrams from miners, bankers, investment houses and industry leaders.

Then, the four top producers appeared to be expanding. And industry demand, while growing steadily, did not seem to warrant all the new activity.

Rumors of renewed Government interest were turning up.

Lithium was becoming a magic word in investment circles.

A small exploration "boom" was getting underway in Manitoba, Quebec and the Colorado-Wyoming-Dakota area.

Why?

If any one man knew the whole story, he wasn't making it available. The whole story would have to answer the questions listed below.

Off-the-cuff explanations ranged from a runaway industry demand to creation of a lithium-containing nuclear reactor which would "kill off the uranium industry."

A simple research job and a study of production statistics was not enough. As Joseph C. Arundale, commodity specialist for the U. S. Bureau of Mines said, "You can find published statements that the world is flat, or that matter cannot be destroyed, and quote those sources faithfully, and still be wrong. Many lithium figures are not just old . . . they may give a completely erroneous picture."

Three months of interviews, research and digging have eliminated many early explanations, confirmed some, and opened new avenues of speculation for others. Talks with Government officials, industry leaders, prospectors, market and investment observers and nuclear energy experts filled in many of the blanks.

Some of it was easy. Men in industry have a tremendous enthusiasm for lithium and its future. They were most cooperative in granting interviews and answering questions, refusing only when the queries got near security matters.

All available published material was combed; a bibliography is contained in the following pages. Government people whose job it is to provide commodity and mineral information were invaluable, both as sources and guides to non-restricted information.

Some of the research was hard. Up-to-date figures are considered classified. No Government source will discuss nuclear or defense applications of lithium. (One such interview consisted entirely of the following dialogue: "I'm pleased to meet you gentlemen. Sorry, but no comment".)

This article will answer the following questions: Who are the most important factors in lithium? How do they feel about its future? Should mining men look for lithium? Where is it found? What are the mining, milling and processing problems?

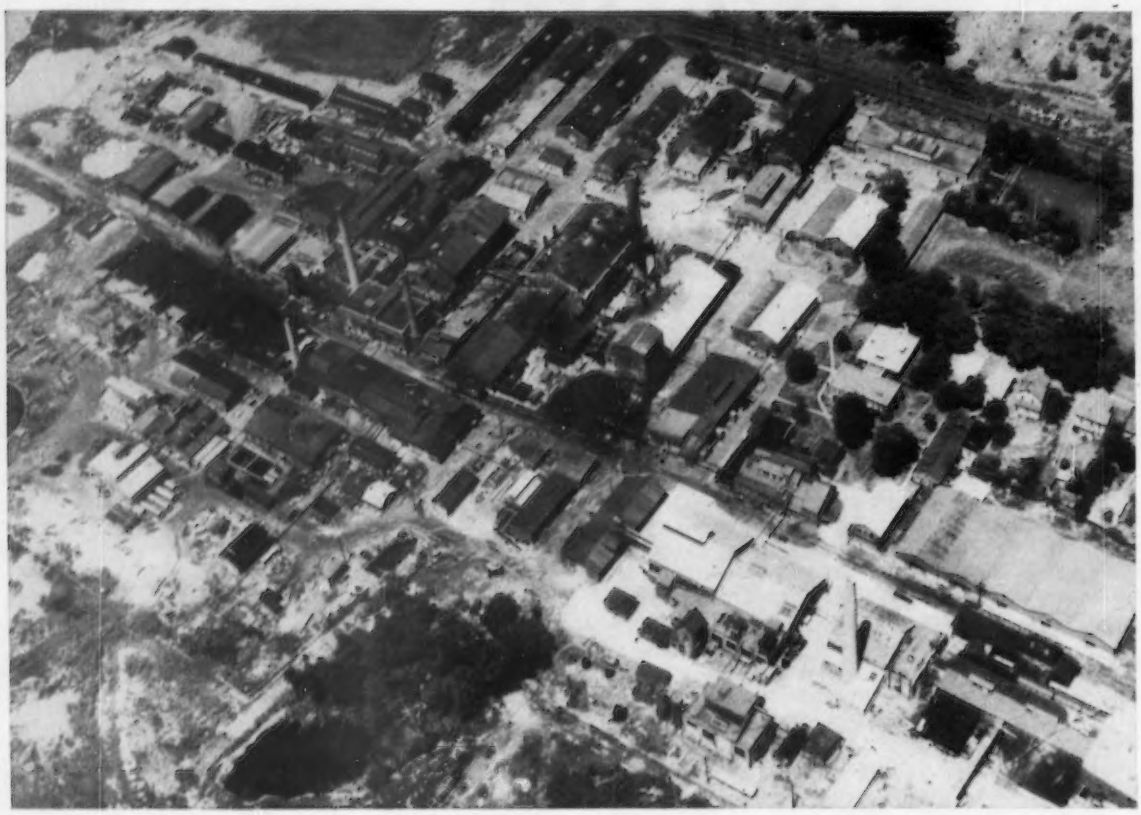
What prices are being paid for lithium-bearing ores? Will the price rise or drop? What are the most recent production figures? Are there any restrictions on trade? What is the probable capacity of the industry?

What are the major uses of lithium in industry? What is the Government's role? Does lithium have nuclear energy possibilities? Fuel possibilities?

The following pages contain facts and figures to provide what you should know about lithium, as a miner, mill man and investor in a nuclear age.

Included, too, are some reasonable guesses, based on published scientific data and correlated bits of information. Where there is a conflict of information, or where security permits a guess, we have tried to provide you with the story as we've been able to get it.

Whatever else lithium may be, it is exciting and it is possessed of a rich future.



EXTENSIVE LAYOUT of Maywood Chemical Works plant in New Jersey gives an idea of the size operation required to produce lithium chemicals from ores. Plant has grown with new demand from its inception in 1906, continues today.

Expansion: To Meet Industry's Demand

THE TOP FOUR PRODUCERS of lithium are expanding. Or, as one industry leader preferred to put it, "We are growing . . . with increased demand." Since 1906, when Maywood Chemical Works began production of lithium and started seeking and creating markets, lithium has increased in use, with the greatest spurt occurring post-WW II.

With accelerated research and applications came the problem of shortage. During the war, when Government encouraged lithium expansion and bought nearly the total output, lithium lost many of its industry outlets.

Now, with what the major producers consider "plenty of lithium," the potential of the versatile product is again growing. No major producer of lithium will discuss the possibility of the Government purchasing lithium, but they say "We're growing with a business that will get better and better." Opinions outside the top four hold that even with Government buying (which Government spokesmen neither confirm nor deny), more than 80% of lithium production is directed to industry uses. Scarcity of supply, one of the big stumbling blocks to lithium's progress, has been eliminated, producers unanimously say.

Evidence of lithium producers' belief that industry and "peacetime" applications will continue to expand is shown in new plant construction, new drilling programs, and purchases of raw materials.

Maywood Chemical, pioneer in the field, has not undertaken large expansion projects. "But," says president Albert J. Turner, "We are increasing output at our present facilities and expanding markets." Maywood began hand-picking spodumene crystals from the famous Etta mine in the Black Hills of South Dakota just after the turn of the century, and is still hand-picking and shipping those crystals to the processing plant at Maywood, N. J. And, says Turner, "We foresee more years of profitable production from the Etta."

Maywood also shares the output of the Tin Mountain, S. D., mine of International Minerals and Chemical Corp., where the latter company mines feldspar and sends lithium-bearing ores to Maywood.

Equipped with what one competitor called "some of the best lithium men in the country," the New Jersey firm also imports some ores from Brazil. Company sells lithium salts, hydride, metal and other chemicals to industry, "all (as Turner proudly says) NF grade. We don't make any other grade." Another source for Maywood's stockpiles at present is spodumene from the Bon Ami Corp. quartz operation in Maine.

Maywood is continuing to look for new sources, but "with no sense of urgency," says Turner. He emphasizes that his firm does not care to go into beneficiation, but seeks only deposits

where the ore can be hand-sorted and the pure ore shipped for processing.

Lithium Corporation of America's most recent expansion involved purchase of some 200,000 tons of spodumene concentrate from Quebec Lithium Corp. of Canada's mine in LaCorne Township, Quebec. Latter company, owned and controlled by Sullivan Consolidated Mines Ltd., has agreed to supply 165 tpd to LCA's new $7-million Bessemer City, N. C., processing plant. Quebec Lithium has proved up a vast deposit of spodumene ore running 1.5% Li_2O and is in the process of building a mill at the site.

Lithium Corp. is also mining spodumene at Kings Mountain, N. C., where it owns a vast tract and is processing that ore (1.2% Li_2O) at Bessemer City. Plant was completed early last year and produces lithium hydroxide from carbonate.

LCA also operates. a processing plant near Custer, S. D., to handle ores gained from mines which it owns in that area, and produces metal, hydroxide and more than 20 other compounds at its chemical plant in St. Louis Park, Minn. Black Hills property was shut down for some time in 1954 due to a shortage of water in the area. LCA has licked the problem with creation of reservoirs.

Though it has imported ores in the past, Lithium Corp. is not importing now, says Percy E. Landolt, LCA consultant and director.

Like other producers, Lithium Corp. is investigating sources of lithium both here and in Canada. Herbert W. Rogers, president, says that his firm has known reserves for 460-million lb lithium carbonate in the U. S. and Canada which "will provide adequately for chemical plant operations for a period of 20 years . . . at a rate equal to the maximum capacities of" the company's two major plants.

American Potash & Chemical Corp. expects to see its new subsidiary, American Lithium Chemicals, Inc., producing at San Antonio, Tex., by late-1955, early 1956. New venture of the veteran potash and brine minerals producer is a joint $6.6-million operation with Bikita Minerals, Ltd., of Southern Rhodesia, which holds the lesser part of a 50.1%-49.9% stock ownership. Bikita, which is controlled by Selection Trust of South Africa and American Metal Co. (and also 21.25% owned by American Potash) will supply lepidolite for the new firm. American Potash president, Peter Colefax, says the new plant was located at San Antonio because chemical grade limestone, low cost natural gas and cheap power were available there. Ore will travel from Rhodesia to Texas gulf ports and be shipped by rail to San Antonio.

Backbone of the American Potash lithium supply is, at least until completion of the San Antonio venture, the brine operation at Searles Lake, Trona, Calif. American Potash sold the 0.032% LiCl contained in the brine to Maywood and others prior to and during the early part of World War II.

With the surge of Government demand, the Trona plant began production of lithium and at the end of 1942 hit a reported peak of 100 tons per month Li_2O. Because lithium is a by-product of the Trona plant, expansion there is determined by demand for the company's other products. Recent years, though, are believed to have seen some 1.5- to 2-million lb lithium carbonate produced annually.

The West Coast firm's Eston plant, at Vernon, Calif., produced lithium chloride, lithium bromide and brines. In 1954, additions were made to produce the chloride.

Foote Mineral Co. was the largest producer of lithium chemicals in 1954, and, according to board chairman H. Conrad Meyer, expects to maintain that position this year.

Foote's new plant at Sunbright, Va., represents the larger part of a $3-million expansion completed in 1953. Sunbright plant production has increased greatly, says Meyer, "and further expansion is now under way." Operations at Kings Mountain, largest source of ore for the vast Foote Chemical operations, have recently included accelerated development and additional beneficiation facilities.

Indicated reserves of mineable spodumene at Foote properties at Kings Mountain (1.5% Li_2O) were set in January 1955 at plus 7-million tons and Gordon Chambers, company president, says that figure has gone over the 10-million level due to more recent drilling.

Foote imports approximately one-half of all ores brought from Africa. In 1954, total imports were set at 20,000 tons of petalite, lepidolite and amblygonite. Discussing further prospecting, Chambers noted that his firm has done work in Africa, New England, North Carolina, Black Hills and in Canada, but so far, they "have not seen anything worth taking out of the ground that is not already being taken out by someone."

Along with the four top producers, developments by Quebec Metallurgical Industries are attracting industry attention. QMI, a subsidiary of Ventures, the vast Canadian group, operates Metal Hydrides, at Beverly, Mass., producers of lithium hydride. The Ventures subsidiary also is reported to exercise indirect control over LaCorne Lithium Mines, which is diamond drilling on its 808-acre property in northeastern Quebec. LaCorne turned over part of its holdings to Quebec Lithium at the start of the staking rush in that area. To date, no further information on the property has been available.

An exploration "boom" has been building in Canada for some months. First interest centered in the LaMotte-LaCorne area, where Quebec Lithium reigns in what has "cooled down" to what one observer calls "at the present time . . . a one-mine camp."

McKirdy and Beardmore areas, in Ontario, were also scenes of large scale staking recently. When the smoke had cleared, Fred M. Connell's Conwest Exploration Co. and M. J. Boylen's Nama Creek Mines held properties with as yet unknown potential.

In Manitoba, "scores of prospectors" entered the bush in June, following announcement that Violamac Mines intended to put up $75,000 for drilling in the Cat Lake area. Lithium Corp. of America already holds property there, as may other producers.

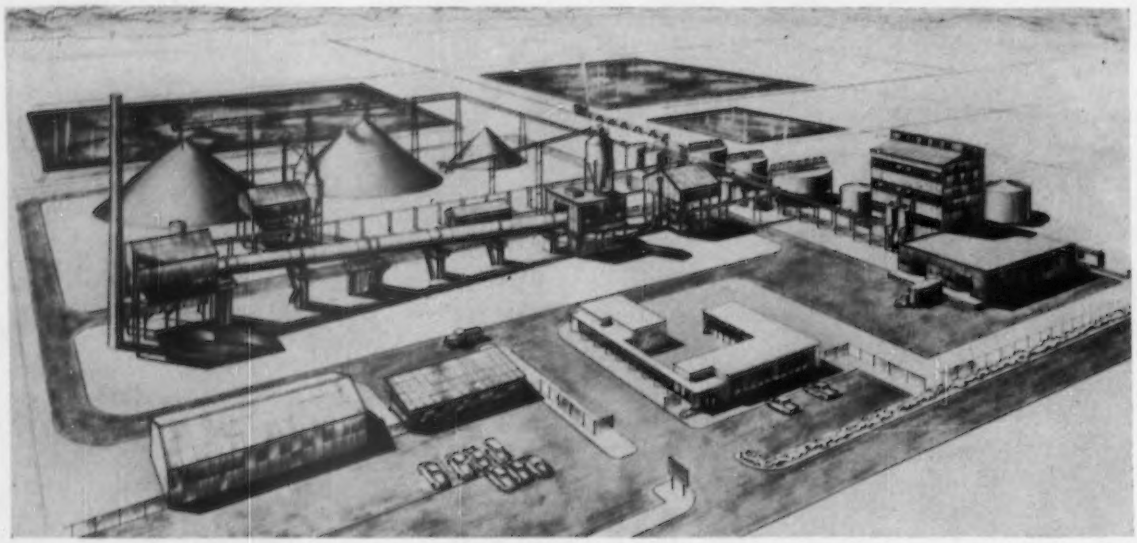
Latest scene of increased activity north of the 54-40 line is near Yellowknife, Great Slave Lake. One industry leader, just returned from the area said, "Every time I turned around, I fell over another lithium man."

Showing a Profit On Mill Tailings

LITHIUM CORP., operating its mill at Hill City, S. D., discovered a brand-new by-product use.

Sparkling white tailings sand, left after processing spodumene, was piled near the mill. At the request of a neighboring community, LCA trucked the stuff to a nearby lake, where it was spread on the shore.

Profit: a beautiful and unusual beach for the area; a tremendous public relations boost for Lithium Corp. of America.



$6.6-MILLION LITHIUM CHEMICALS plant at San Antonio will treat Bikita lepidolite ores for American Potash & Chemical Corp.'s American Lithium Chemicals Inc. Plant completion is expected by late 1955 or early 1956. Limestone is employed.

Nearly a hundred other companies and individuals are staking and drilling in Canada, but so far no major new finds have been announced.

Latest news is that Lithium Corp. of Canada "hopes to begin production of lithium in Manitoba by spring of 1956." Firm has earmarked $600,000 for drilling and exploration and will sink a shaft. Australian correspondents say that the Pilangoora area, Western Australia is currently being searched for spodumene and lepidolite. South Africa, too, is reportedly searching for new sources.

Interest in lithium prospecting and investment is running high on the Colorado Plateau, according to observers.

Ore reserves of some 1.5-million tons are reported by U. S. Lithium Corp. at Gunnison, Colo. The firm, according to N. G. Morgan Jr. has indications "for a firm foundation for the company's program of becoming a chemical enterprise."

Recent Arizona reports disclose sale of lithium properties near Wickenburg to Uranium Enterprises of America for "millions of dollars."

Most unexpected rumor was one from Canadian sources that some of the major Minnesota-Michigan Iron Country producers are showing interest in lithium in northern areas.

Discussing the exploration boom and other "gossip" about a tremendous increase in lithium demand, the major producers note very firmly that, at least as far as can be seen, finding lithium-bearing ores is not enough.

They agree that no miner would be turned away from their offices if he showed up with ore, but they emphasize to a man that they are only interested in good grade, plentiful, accessible deposits. The economics of mining, processing and refining lithium, as described in the following pages, obviously preclude long-haul, low grade operations.

Each of the leaders qualifies that position, saying in effect, "The time will probably come when that kind of deposit will be valuable, but with present economics what they are, that's for the next generation."

The role of Government in lithium production and consumption is a combination of clearly-stated activity and cloudy speculation.

Support and "No Comment"

HISTORY of lithium and the U. S. Government is a combination of support in 1942 of the expansion program and today's reluctance to discuss lithium's defense and nuclear possibilities.

Much of the factual information in this article is based on Government figures. The estimates and "reasonable guesses" were formed on the basis of non-Government information and textbook possibilities.

In 1942, the U. S. bought lithium, encouraged major producers to expand their production, and conducted large-scale research programs. On December 5 of that year, lithium was placed under War Production Board controls and development of Kings Mountain and its vast reserves was requested. Some of the construction which represents today's expansion was aided by guaranteed loans, accelerated amortization and other public gestures. Defense Production Administration, according to published reports, asked 10-million lb lithium carbonate by 1955, was allowing tax write-offs "as high as 80%."

Since the war, it has been harder to pin down the activity of Government departments, but some things are clearly stated.

Lithium is not being stockpiled by the Government. USGS, DMPA and USBM are not encouraging prospectors to look for lithium. The Raw Materials Division of AEC is not buying lithium and is not looking for it. Lithium is not listed under the Atomic Energy Act. Export license requirements were put on lithium April 28, 1955 "to protect the national security." These facts were gained by direct questioning of the departments involved.

The traditional "no comment" responses began cropping up when other departments were interviewed. AEC Production Dept.: "I'm sorry, I cannot discuss lithium with you at all." Is Government buying lithium? "No

comment." Defense Dept.: "We are not buying lithium, except as it may be contained in the finished products which we do buy. I'm afraid I cannot discuss any possible defense or nuclear uses of lithium."

What some of those uses might be, based on textbook possibilities and guesses by observers, may be found in the last part of this article.

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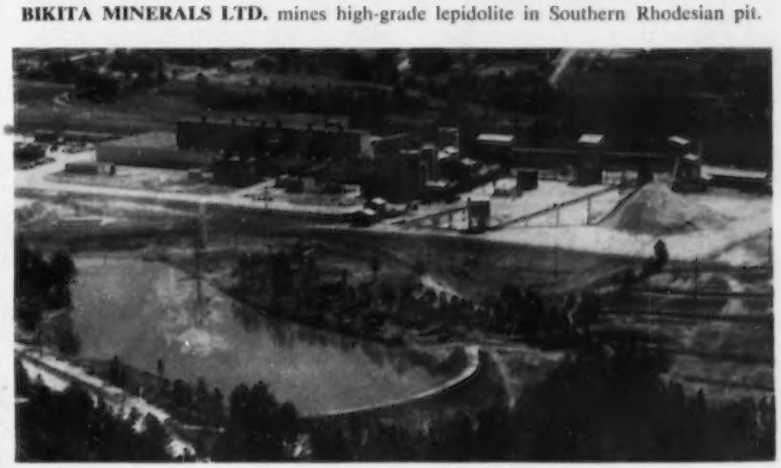
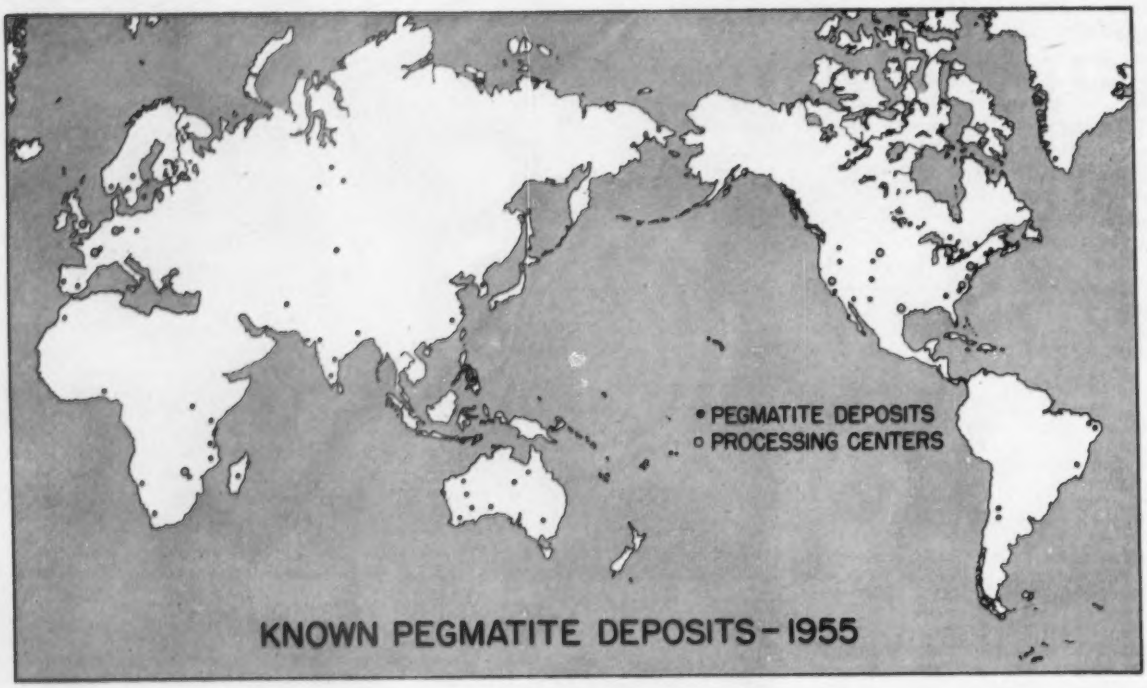
FOOTE MINERAL CO. spent over $3-million developing Kings Mountain. Ore is difficult to handle for the first 50 feet due to weathering; remainder handles very well.

BIKITA MINERALS LTD. mines high-grade lepidolite in Southern Rhodesian pit.



LITHIUM CORPORATION OF AMERICA built its new mill at Bessemer City, N. C., to handle ores from its nearby Kings Mountain property and from Quebec Lithium's vast holding.



To Find Lithium—Find Pegmatites

INDUSTRY ENCOURAGES the prospector to look for good deposits in accessible areas. Certainly the U. S. producers would welcome another Etta mine or a Kings Mountain. They are quite happy with their present and future reserves, but they are still looking for rich deposits.

Not every deposit of lithium will be of value. Cut-off-point of mining and concentrating is placed at 1% Li_2O. Even if the deposit is bonanza-rich it still must be in an accessible area and close to a refinery. Refineries are located at Maywood, N. J., Sunbright, Va., Bessmer City, N. C., Hill City, S. D., Trona, Calif., and San Antonio, in the U. S.; in France, Germany and England, and, presumably, in Russia.

If a miner wants to sell a deposit or wants to mine it profitably, its got to be rich. Its got to be big. Its got to be close to a market.

Biggest source of lithium-bearing minerals, failing the discovery of another Searles Lake, is the pegmatite, "the garbage can of the earth."

If a chemical compound exists in nature, it can probably be found in one pegmatite or another. Nature of the deposit may be acidic, basic, or syenitic. It may be all quartz, all spodumene, all feldspar, all cryolite (as at Ivigtut), a mixture of two or more, and totally lacking in another. Pegmatites may exist as dikes, sheets, pipes or irregular masses in the roofs and upper parts of batholiths.

These "giant granites" were formed by the slow cooling and differentiation of the magma. Presence of steam and the gases of fluorine and chlorine probably aided in slow-cooling, large-crystal formation.

While the slow cooling was taking place the heavy minerals settled to the bottom and the light minerals concentrated at the top of the mass. Usually a thin layer of mixed light and heavy minerals formed at the top of the mass before differentiation could take place.

Rare Minerals Present

Spodumene, amblygonite, lepidolite, petalite, mica, quartz, feldspar, ruby, diamond, zircon, monazite, garnet, rutile, topaz, tourmaline, beryl, and other gem stones are found in pegmatites. The minerals cassiterite, wolframite, columbite, tantalite, hornblende, gold, the sulphides, the arsenides, magnetite, ilmenite, scheelite, apatite and molybdenite are also found, along with the rare earths, radium, uranium, the rare phosphates, fluorides and cryolite.

Pegmatites may be largely one mineral or a mixture of two or more. Those in the same vicinity may contain entirely different minerals (Black Hills). Some are associated with basic rock. A few are banded and grade into quartz veins. Small amounts of heavy minerals present usually make it necessary to mine the pegmatite for quartz, feldspar or spodumene and recover the heavy minerals as secondary products.

Extremely large crystals are common in pegmatites. Beryl logs of over 9 tons, spodumene logs over 40 tons and amblygonite masses over 90 tons have been reported. The crystalline nature of the pegmatite makes it relatively easy to drill and blast.

Lithium in minerals can be identified by the crimson color imparted to a hot flame. Color is generally masked by sodium, but the yellow color of the sodium ion can be filtered out with a blue glass filter. Potassium ions show a violet-red flame color, which at first will give a little trouble, but after a little practice the difference becomes apparent. Canadian Department of Mines and Natural Resources recommends an acetylene torch as a means of getting the flame temperature needed to conduct the test.

Dilithium phosphate from Searles

Lake is most valuable in terms of Li_2O content, with amblygonite, spodumene, lepidolite, zinnwaldite and petalite following.

Spodumene is the main staple for chemical refining to all forms now on market, although amblygonite contains more Li_2O per ton concentrate. Spodumene is stressed in this article because it is the only form of lithium mineral found in large quantities in North America at the present time. All the known amblygonite deposits have been worked out. Producers tend to rely on spodumene for this reason and will turn to amblygonite only when large deposits are found.

Three gem stone varieties of spodumene exist. Hiddenite is yellow-green. Kunzite is lilac to pink. Triphane is yellow. Foote and Lithium Corp. will buy spodumene concentrates if the miner can meet price and specifications. Maywood will buy good clean hand-picked spodumene.

Amblygonite is higher in Li_2O content than spodumene and would be more valuable to the refiner if sufficient quantities were available. It is popular in Europe, where spodumene is scarce. Foote will buy it if specifications are met. LCA and American Potash will not. Maywood will buy good clean hand-picked crystals. No large amblygonite deposits are known to remain today.

Lepidolite Axiom

Except at the newly proposed American Potash operation at San Antonio, lepidolite has never been used for chemical production, due to the presence of potassium in the mineral. Potassium in a limestone roasting process consumes limestone and, since there is more potassium in lepidolite than there is lithium, consumption of limestone will be much higher than in the limestone-spodumene process. Most lepidolite is used directly by the glass-making industry to produce flint, opal and Pyrex glass. Concentrates can be sold to Foote, American Potash and the glass industry. Lithium Corp. might buy it. Most lepidolite is hand picked and the axiom here is if you have to do any more than hand pick it —leave it in the ground. No large deposits are known in North America.

Zinnwaldite is found, and used, in Germany, but little has ever been found in North America.

Petalite is used as a concentrate by the glass and ceramic industry. Axiom for lepidolite applies to petalite. Foote will buy it. So will LCA. No commercial deposits known in North America.

Compound, dilithium sodium phosphate is recovered by the evaporation of lake brines and cannot be considered a true lithium mineral. Li_2NaPO_4 is found in Searles Lake, Great Salt Lake and the Salduro Marshes.

The largest known deposit of lithium is in the Belgian Congo, but difficult transportation precludes exploitation at this time. Other major deposits are Kings Mountain, Black Hills, New England, Quebec, Manitoba and the Northwest Territories.

McKirdy Potential

McKirdy region in northwest Ontario, still relatively unknown, is believed by some to be the best in Canada; as high grade as Quebec Lithium's property at LaCorne and having the advantage of roads, power and nearby lake transportation.

Quebec's Val d'Or region is 15 miles long on east west strike. It is a series of dikes varying from 10-50 ft in width and on a nearly vertical dip.

Slave Lake region in the Northwest Territories has attracted interest of late but geologists for U. S. producers feel, on the basis of current knowledge, that while the dikes are high grade they are also narrow, comparatively short and lack extensive reserves. The isolated nature of the area precludes any large scale exploitation at this time.

In the Yellowknife area, N. W. T. a strike of 15 dikes, of which 12 are said to contain sizeable amounts of lithium, has been made. One dike, reported to be 40% spodumene, is 3,000 ft long and 25 ft wide.

Kings Mountain district is 25 miles long and about 2 miles wide. Area has been estimated to contain 4-million short ton units of 1.7% Li_2O ore and 124-million units of 1.3% ore.

Black Hills ore contains many scattered showings. Deposits in this area are estimated to contain 1-million units of Li_2O.

According to investigations of YU. M. Dymkov the Kalbin Range in the western part of the Altai Mountains in eastern Russia contains pegmatites holding spodumene, amblygonite, lepidolite, some petalite and pollucite lithium.

Karibib deposits in Southwest Africa were described by Ernie Enck of Foote Mineral in 1951. Deposits were uncovered by German artillery practice in WW I. One quarry now being worked is 40-ft wide. (See photo on page 86.) All the lepidolite occurs in quartz blows. Enck noted that Southern Rhodesia and Mozambique deposits are low in grade and high in objectionable impurities. Mozambique location presents mining and transportation difficulties.

Major Lithium Minerals

Spodumene, $Al_2O_3 \cdot LiO_2 \cdot 4SiO_2$, is 4-7% Li_2O. Prismatic crystals, often of great size. Usually in log form. Hardness 6.5. Specific gravity 3.1-3.2. Index refraction 1.660-1.676. Fusibility 3.5 Insoluble in acid. Color ranges from white to pale green, pink and lilac. Streak white. Cleavage perfect. Fracture uneven to splintery. Luster vitreous to pearly. Opaque to translucent. Brittle.

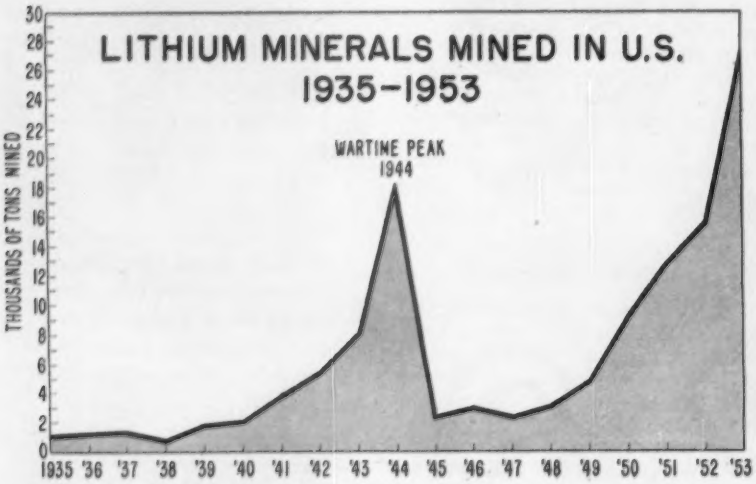
Amblygonite, $Al_2O_3 \cdot P_2O_5 \cdot 2LiF$, is 7-9% Li_2O. Coarse cleavable mass, often of great size. Massive. Hardness 6. Sp. gr. 2.88-3.09. Index refr. 1.579-1.597. Fus. 2. Soluble in acid. Color ranges from white to yellow-brown, green and blue. Streak white. Cleavage perfect in one direction only. Fracture uneven. Luster vitreous to pearly. Translucent to opaque. Brittle.

Lepidolite, $Al_2O_3 \cdot 3SiO_2 \cdot 2K, LiF$, is 3-4% Li_2O. Compact aggregate of small mica-like plates forming scaly granular mass. Occasionally in short prismatic crystals. Rarely in large plates or sheets. A lithia mica. Hardness 2-4. Sp. gr. 2.8-2.9. Index refr. 1.56-1.605. Fus. 2. Soluble in H_2SO_4 and slightly soluble in HF. Color ranges from pink to lilac, gray-white, yellow, red and purple. Streak white. Cleavage basal. Luster pearly. Translucent to transparent. Sectile.

Zinnwaldite like lepidolite except sp. gr. is 2.0. Slightly soluble in HCL.

Petalite, $Al_2O_3 \cdot Li_2O \cdot 8SiO_2$, is 2-4% Li_2O. Hardness 6.5. Sp. gr. 2.39-2.46. Fus. 5. Soluble in HF.

In addition to these five major lithium bearing minerals there are 140 others containing lithium. At present the others have no economic value in the industry.



DRASTIC DIVE when Government stopped purchases in '45 will not occur again, say producers, because private industry now takes more than four-fifths of output.

LEPIDOLITE from Bikita Minerals mine is received in U. S. for American Potash.

Will Consumers Get Enough Lithium?

IN ITS PRE- AND POST WAR ups and downs, lithium has faced three basic obstacles to rapid expansion: limited supply through known reserves and uninterrupted output, need for a lower price to encourage greater industry research and application, and lack of long-range study of potential and practical uses.

The first problem has been solved, industry leaders agree. There is lots of lithium. (Foote Mineral followed that statement in a recent promotional pamphlet with the non sequitur "—And that's no Li!") Each of the top four considers himself well supplied with raw material and each is looking for more in a belief in future expansion.

Manufacturers and consumers of lithium who have held back because they feared shortages of lithium no longer need fear, say the leaders.

The high cost of lithium also may be keeping some potential customers away, say some factors in the industry. While no major producer will make any specific statement for obvious reasons, agreement is general that, with more raw material being made available and the use-potential growing, prices will go down. And so, presumably, will the value of lithium in ore.

Lithium's great versatility has, to hear almost any scientist, barely been touched. Its high gaseous absorption, affinity for water, its light weight, its unique function in organic synthesis, its temperature-lowering quality in the Hall aluminum cell and in ceramics, all promise wider industry application. Its nuclear and propulsion fuel roles cannot yet be revealed in detail, but no student of nuclear physics doubts that they exist. (See page 88.)

The charts on the facing page show the consistent rise of output by lithium-mineral producers to 1953. Production and consumption figures for subsequent years are considered classified, and are therefore not available.

Production capacity by the United States to the equivalent of 10-million lb lithium carbonate in 1955 was requested by the War Production Board in 1942. In his 1953 chapter of Minerals Yearbook, J. C. Arundale says, "the goal . . . seems assured of achievement." On the basis of *E&MJ*'s present research, interviews and study, the production capacity of the U. S. is set at somewhere between 20- and 25-million lb of carbonate annually.

Maximum lithium metal capacity in 1955, with three of the four top producers supplying, is estimated in the neighborhood of 400,000 lb.

Variance between the 20-25 million lb maximum capacity and 8.9-million lb estimated 1955 consumption as shown on the opposite page must remain a mystery. The unknown factor in the lithium picture is, as it was in 1953, the U. S. Government. If, and how much the Government may be buying for research, for actual use, is not known to non-security-cleared people.

In the last two pages of this article, some of the possible defense and nuclear applications of lithium are discussed. No Government source will discuss those applications, offering only the classic "no comment." In any event, most observers doubt that the now-secret uses could account for more than 20% of production.

Besides production in the U. S., Canada, Africa and Brazil, the Belgian Congo is considered an important factor. Spodumene comprises an important constituent of the tin-bearing pegmatite at Manono, which is operated by Geomines of Belgium. First exports, some 5,200 metric tons, were made (presumably to Belgium) in the first quarter of 1951.

Societe des Usines Chimiques Rhone-Poulenc, Paris, produces lithium carbonate, hydroxide, fluoride and chloride, at a full-capacity rate of plus 10 metric tons per month. Rhone-Poulenc acquires lepidolite and spodumene from South Africa.

Process used by the French firm was developed by the company and, while they say it is not the same as those used in the U. S., they consider it confidential.

In 1953, consumption of lithium compounds in France was rated percentagewise (of the Rhone-Poulenc output): batteries 35%; greases 25%; pharmaceuticals 20%; aluminum and magnesium welding, 20%.

Lithium-bearing minerals are imported to the U. S. duty free. Metal is dutiable at 25% ad valorem and lithium compounds at 12½ % ad valorem. Dominion of Canada requires a duty on any processed product, but permits free exit of minerals.

World Lithium Mineral Production**

(in long tons)

Producing area	1948	1949	1950	1951	1952	1953
So Rhodesia (ambg)	....	....	179	170	80	300
*lepidolite	....	....	....	1,567	1,101	6,859
petalite	....	....	....	....	100	10,339
spodumene	....	....	....	....	40	40
So West Africa (amb)	157	116	261	516	637	302
lepidolite	1,215	799	8,320	9,902	7,066	7,538
petalite	160	120	161	155	1,048	1,427
Uganda (ambg)	....	200	265	19	....	16
Un So Af (ambg)	....	....	13	....	....	54
Aust (petalite)	....	5	....	....	....	....
Portugal (ambg)	....	18	10	17	10	16
liphyllite	....	....	6	49	....	....
Spain (ambg)	....	....	....	....	10	....
Mozambique (lep)	....	590	218	275	1,083	5,622
United States min & compounds	3,465	4,320	8,309	11,515	13,938	....

*Southern Rhodesia produced 36,350 long ton Li ores in first nine months of 1954.

**Colonial Geological Survey, Statistical Summary of the Mineral Industry, 1948–1953, London.

Exports of Lithium Minerals*

(in long tons)

Exporting area	1948	1949	1950	1951	1952	1953
So Rhodesia Li minerals	....	....	187	3,312	1,866	17,079
So West Africa (ambg)	....	245	85	94	459	400
lepidolite	1,454	1,084	6,947	8,258	7,225	8,982
petalite	163	4	230	284	1,255	1,322
Uganda (ambg)	....	200	265	19	....	16
Portugal	....	....	....	....	27	29
Belg Cong (spod)	....	....	....	5	....	....
Mozambique (lepid)	....	....	....	....	....	4,950

*Colonial Geological Surveys, Statistical Summary of the Mineral Industry, 1948–1953, London.

U. S. Consumption of LiOH as Monohydrate

1951	831,063 lb
1952	1,676,717 lb
1953	2,326,818 lb

African Exports of Lithium Concentrates 1951-1953*

(in short tons)

	Southwest Africa			Southern Rhodesia		
Destination	1951	1952	1953	1951	1952	1953
United Kingdom	2,100	365	1,378	20	124	28
Australia	....	....	44	....	....	....
France	....	534	843	....	701	637
Germany (West)	110	1,145	1,596	45	368	624
Netherlands	....	....	25	....	....	91
United States	1,500	22	15,243	7,507	8,819	10,609
Union of South Africa	....	21	....	56	....	....
Belgium	....	3	....	....	....	....
Total	3,710	2,090	19,129	7,628	10,012	11,989

*Mineral Trade Notes.

1955 Lithium Concentrate Prices

(at the mine*)

Spodumene, 6% Li_2O	$11–12 per short ton unit.
Amblygonite	$60–75 per short ton.
Lepidolite, hand picked	$11–12 per short ton unit.
Petalite, hand picked	$11 per short ton unit.

*E&MJ Metal & Mineral Markets sources. Prices are subject to negotiation. Quantity, quality and shipping costs will determine final price paid to miner.

U. S. End Use of Lithium Compounds

	1951*	1953 E&MJ Estimate*	1955 E&MJ Estimate*
Pharmaceuticals	33	180	200
Storage batteries	393	260	550
Air conditioning and refrigeration	320	360	450
Lubricating grease	816	2,500	3,500
Welding and brazing flux	287	450	750
Ceramics	779	2,000	3,500
Defense and misc	393	....	....
Total	3,021	5,750	8,950

*In terms of thousands of pounds lithium carbonate.

African Production of Lithium Concentrates* 1948-1953

(in short tons)

	Southwest Africa			Southern Rhodesia				Moz.
	Amblygonite	Lepidolite	Petalite	Amblygonite	Lepidolite	Petalite	Spodumene	Lepidolite
1948	176	1,361	179	....	....	....	....	....
1949	130	895	133	....	....	....	....	....
1950	292	9,318	180	....	....	....	....	244
1951	578	11,090	174	....	2,346	....	....	307
1952	714	7,914	1,174	90	1,233	112	45	....
1953	338	8,443	1,598	336	7,682	11,580	45	6,283

*Mineral Trade Notes, a monthly publication of U. S. Government Foreign Service Office. U. S. Bureau of Mines.

Nominal Price of Lithium Chemicals in 1955

(dollars per lb)

Benzoate	1.65
Bromide, N. F.*	2.15
Carbonate, N. F.	1.30
Chloride	1.10
Citrate, N. F.	1.60
Fluoride	2.20
Hydride	14.00
Hydroxide	0.90
Manganite	1.00
Metal	11.00
Nitrate	1.25
Salicylate	1.60
Silicate	1.10
Sulphate	0.48
Titanate	1.15

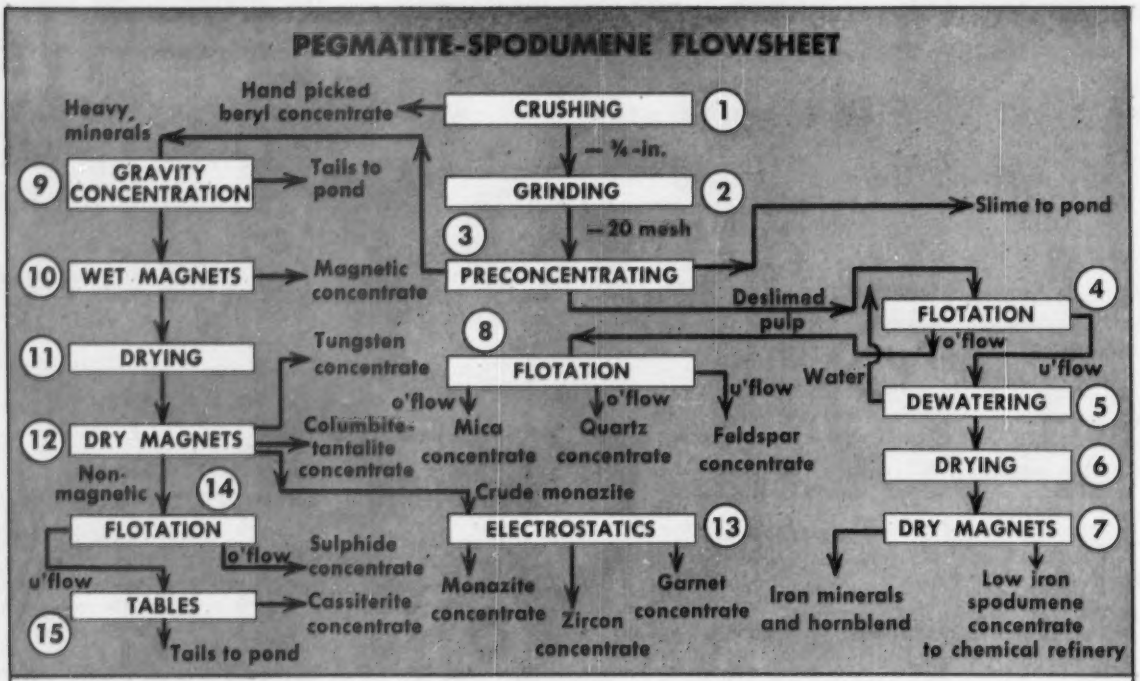
*N. F., National Formulary specifications. This table is condensed from *Oil, Paint & Drug Reporter*, 1955.

EDITORS' NOTE

WHILE BRAZIL is considered one of the prime sources of lithium-bearing minerals, no production figures are available on that nation.

Earlier lithium references have said that there was an embargo placed on lithium by the Government.

The office of the Consul General of Brazil in New York City says that his nation requires an export license and a license from "another Commission in the Government".



This flowsheet is designed from the combined flowsheets of those companies beneficiating pegmatite ores for the minerals contained. No pegmatites will contain all of these minerals shown in the flowsheet. Flowsheet will have to be designed with the knowledge of values contained.

LEGEND

1. Crushing to minus ¾-in. is done by jaw crusher or cone crusher. If beryl is present it is best to attempt to hand pick ahead of the crusher. At present time no economical method for flotation recovery of beryl from a spodumene flowsheet is known. Open circuit grinding is reported as satisfactory, but closed circuit will produce less fines. Screens and grizzlies needed to control sizing

2. Grinding in rod mill more satisfactory than in ball mill. Screens to return plus 20 mesh oversize to mill

3. Preconcentration to remove slimes, to concentrate heavies for gravity separation and to prepare a spodumene flotation feed will depend upon the minerals present in the ore. Desliming is necessary ahead of flotation.

A. Humphrey spirals can be used to prepare a heavies concentrate, but tabular crystals of spodumene tend to report in the heavies

B. Screens have been used where a separation of coarse and fine sizes also makes a separation between spodumene and heavies or spodumene and coarse gangue

C. Jigs have been used to concentrate heavies

D. Tables have been used to concentrate heavies and/or to deslime. Where jigs and tables are used, it is necessary to classify feed by hydroclassification methods

E. Sand classifiers have been used to deslime and to thicken pulp ahead of flotation

F. Heavy media has been used to make heavies separation. It is possible to concentrate some beryl with the heavies. Spodumene can be deslimed as underflow with mica, quartz and feldspar in overflow

G. Wet cyclones have been used to deslime ahead of flotation. Some difficulties have been encountered in abrasion wear on cyclone orifice. Proper rubber-lined cyclones seem advantageous. Change in orifice through wear will change characteristic of separation. Attrition or scrubbing cells have been used in conjunction with cyclones to deslime loamy ore

H. Flotation, after 70% pulp density conditioning with reagents, has been used as a desliming stage. Soap has been used as collector of slimes. Cationic collectors have been used. Amines with alcohol collector have been suggested. Glue or starch used to depress spodumene at pH 10-11. Pulp density of feed should be 25-30% solids. Aluminum nitrate will depress spodumene. High pH keeps spodumene and iron minerals in underflow with some mica, quartz and feldspar in slime overflow. Lepidolyte, zinnwaldite, amblygonite and some beryl will tend to go in overflow. One producer is considering going back to this method to replace cyclones

4. Deslimed pulp, containing spodumene, silicates and iron minerals, is conditioned at about 70% pulp density with HF, H_2SO_4 and amine resinate collector. Pine oil can be used as frother. Mica, quartz and feldspar report in overflow. Iron minerals, hornblend and spodumene stay in underflow at pH less than 5. Pulp density at feed cell should be 25-30% solids

5. Sand classifier and filter to dewater. Return water to flotation

6. Direct fired rotary drier

7. Electro magnetic separators to remove hornblend and iron minerals. Iron free concentrate of spodumene shipped to chemical refinery

8. Flotation treatment of overflow from spodumene flotation can be made to prepare a mica concentrate, a quartz concentrate and a feldspar (underflow) concentrate by HF flotation methods

9. Jigs and/or tables have been used to produce heavies concentrate from ore. Pegmatites may contain cassiterite, columbite, magnetite, tantalite, monazite, zircon, garnet, sulphides and tungsten-bearing minerals. Minerals present in ore will determine mill design

10. Wet magnetic separators produce a magnetic concentrate and a weakly magnetic feed to the drier

11. Dewatering or filtering necessary ahead of the drier

12. Electromagnets produce a tunsten concentrate and/or columbite-tantalite concentrate, a non-magnetic flotation feed and/or a crude monazite concentrate

13. Electrostatic separators prepare concentrates such as monazite, zircon and garnet

14. Xanthate flotation of non-magnetic tails produces sulphide concentrate with flotation tails going to tables

15. Table concentrates cassiterite mineral and tails go to pond

How to Process at a Profit

LITHIUM, from start to finish, represents a battle against processing losses and shipping costs. A profit can be made mining, milling and refining lithium ore, but it won't come easy.

Consensus in the industry is that 1% Li_2O ore is cut-off point for economical mining and milling. Assuming 100% recovery, a 1% Li_2O ore is only $11 rock. However, as Foote Mineral points out, recovery in the start-up phase of mining and milling will be closer to 60%. Later on milling recovery may approach the 80-90% now enjoyed by Foote, LCA and American Potash. Total recovery from ore to refined lithium carbonate will be 70% at best, they say. From carbonate to finished compounds little is lost, since any unreacted material can be returned to previous stages of the flowsheet. Salts of lithium are easily formed and easily purified, but their reactive nature and consumers' purity demands make the cost of equipment high.

Mining the Pegmatite

Cost of an underground mining and a milling operation, including exploration, development, replacement and depreciation, will run $5-7 per ton of mill feed. With a 1% ore, concentration ratio of 6 to 1 is necessary. Six to one concentration at 60% recovery means handling about 10 tons of rock, at $5-7 per ton to make one ton concentrate; $50-70 per ton concentrate, plus shipping costs.

Recovery in the industry is 80-90% at milling stage. Let's assume a program has an 80% milling recovery. At 80% recovery with about 8 tons of ore milled, cost will be $40-56 per ton concentrate worth $66-72 per ton, plus shipping costs. Obviously, shipping costs must be low.

Open pit costs will be somewhat lower than $5-7 per ton rock for underground. Let's take a look at lithium mining practice.

Maywood operates the Etta by underground stoping and caving methods, sorting the spodumene by hand. As stope-ore peters out on each level, the level is caved to the next. At present two levels are being mined. One is 65 ft below the quarry floor and the other is 65 ft lower. Quarry was formed by repeated caving. Quarry floor is now several hundred feet down the hill from the original tunnel entrance. Fifty men operate the mine on one shift basis.

International Minerals & Chemical open pit mine at Tin Mountain, S. Dak., employs about 25 men. Mine produces 1,000 tons feldspar a month, plus whatever beryl, spodumene and amblygonite occurs. Hand-sorted spodumene and amblygonite go to Maywood. Some columbite and tantalite are produced.

Bon Ami Corp. produces quartz and spodumene from their mine in Maine, shipping hand-picked spod to Maywood.

LCA mines Beecher No. 2 underground. Edison, near Keystone, and the Mateen are open pit. Spodumene is the principal ore. Property at Kings Mountain is open pit.

Quebec Lithium has announced intentions to mine LaCorne deposit underground.

When Foote Mineral began open pit mining at Kings Mountain, they used two 4-in. wagon drills and two jack hammers to strip and mine. Northwest 25 shovel and Bucyrus-Erie 38-B shovel handled ore and waste. Secondary breaking was by 4,000-lb drop ball. Two Euclid 10-ton trucks and two 2-ton GMC trucks were used for hauling. TD 18 'dozer worked in clearing, cleaning and roadbuilding. First 50 ft of pegmatite is exposed and badly oxidized. Some difficulty is encountered in drilling, blasting and milling this oxidized material. Lower levels are reported to be much easier to handle.

Petalite and lepidolite deposits at Karibib are mined open pit; hand-picked, as are the other African and Mozambique mines.

Flotation is the backbone of spodumene concentration. All petalite and lepidolite are concentrated by hand. Run-of-mine roast refining can only be employed where a good supply of limestone or acid, fuel and reagents are available.

Lithium Corp. uses flotation at its Black Hills mill at Hill City, S. Dak. Mill was shut down periodically due to lack of water. But now reservoirs have been installed to guarantee a year-'round supply and mill is back in operation. Flotation concentrate is given an acid roast to produce lithium sulphate ($LiSO_4$).

LCA does not concentrate Kings Mountain ore, but uses run-of-mine roast refining method described below.

Quebec Lithium is planning to concentrate LaCorne ore by flotation at the new plant now under construction.

Cyclones to Deslime

Foote Mineral uses flotation at Kings Mountain. Ore is crushed and sent to pebble mills. Concentrate containing columbite-tantalite and cassiterite (about 5% of total feed) is made by heavy media separation. Tailings from heavy media are deslimed in wet cyclones before pulp is thickened to 55% solids and conditioned with reagents. Conditioned pulp is diluted to 25% solids and floated in a manner similar to that described in the flowsheet on page 84.

Spodumene remains in underflow and quartz, mica and feldspar overflow. Concentrate is dried in open air drying pads. If spodumene is to be used directly in glass manufacture, it is given a magnetic separator pass to remove iron bearing materials. Present recovery is 80-90%. Foote declines to comment on method used to treat oxidized ore.

Before Black Hills Tin Co. mill burned down in 1952, experience indicated that a 6% flotation concentrate was difficult to make; 4-5.5% more likely than 6%.

American Potash method used at Searles Lake is unique in the indus-

OLD METHOD used to mine lepidolite in Karibib, Southwest Africa, produced 8,443 tons in 1953. U. S. bought 20,000 tons from Africa in 1954.

NEW METHOD of metal production was developed at Lithium Corp.'s St. Louis Park Laboratory.

try. Lithium is recovered as dilithium sodium phosphate from the brine (0.032% LiCl). Evaporation and subsequent separation of the brine yields a crude concentrate containing the phosphate and burkeite salt. Crude is upgraded by floating the phosphate out of a kerosene medium with soap. Flotation concentrate is further refined to 20% Li_2O by heating the froth to 150 deg F and dissolving out the remaining burkeite.

Finished concentrate is filtered and dried. Process then follows the lithium sulphate, carbonate, chloride and bromide production pattern described later. Plant had a capacity of 150 tons per month in 1953, but that figure has been raised considerably, says American Potash. Recovery in 1953 was about 70%. Recovery today is closer to 90%, greatly increasing the output of the plant without expanding the size of the mill.

An old method for concentrating spodumene called for 1,000 deg C roast to decrepitate and convert the spodumene to beta, then impact crushing and air separation to concentrate the finely divided beta spodumene.

Each refiner uses a different method to chemically extract the lithium from the ore or concentrate. In addition, several other methods have been proposed. None of the producers will elaborate on his particular method. Without giving away trade secrets the following can be said about the methods being used to produce the many lithium chemicals now on the market.

American Potash will build a concentrate-limestone roast refinery at San Antonio to treat hand-sorted African lepidolite. This will be the first large scale attempt to produce chemicals from lepidolite concentrate, which contains only 3-4% Li_2O as compared to 6-8% for spodumene. Also, lepidolite contains potassium which must be accounted for in the reaction. Roast will produce LiOH as end product.

Maywood will not discuss chemical refining at all. Only comment is that they find it cheaper to hand-pick ore and to process by their method than to float and use either the acid or limestone roast technique. In addition to cost, they note that their method produces a much purer grade of material—it's all National Formulary grade.

Unique Acid Roast

LCA uses run-of-mine acid roast method on ore at Kings Mountain and on concentrate at Hill City, S. D. Concentrates purchased from Quebec lithium and containing above 4.5% Li_2O will be processed at Bessemer City, N. C. Ore or concentrate is roasted at 1,000 deg C to convert alpha spodumene (specific gravity 3.15) to beta spodumene (specific gravity 2.4) and to decrepitate or shatter the spodumene. Beta spodumene is more soluble than alpha. Beta is given a second roast at 200-350 deg C, with sulphuric acid and calcium carbonate, to produce lithium sulphate ($LiSO_4$). Sulphate is water leached from the residue and converted to LiOH as end product. Residue from the kiln is a potential cement raw material.

Spotting the Refinery

Producers all agree that it takes plenty of money to get into the lithium chemical business. Indicative of the high equipment cost are Foote's two 385-ft cement kilns at Sunbright, plus additional facilities needed to produce tonnage quantities of carbonate, chloride, metal and metal derivatives. Foote uses the limestone roast on flotation concentrate at Sunbright, Va. End product is LiOH. By-product from the kilns is a cement raw material.

In setting up a refinery, consideration must be given to location of the plant. Should the refinery be built near the mill or the concentrate shipped to a refinery? Foote decided to build at Sunbright and ship concentrate, because it was cheaper than to bring limestone, coal and reagents to Kings Mountain.

American Potash is building its refinery at San Antonio and will import African concentrate because limestone and natural gas are cheaply available in Texas.

Bureau of Mines piloted a method calling for high temperature roast with calcium chloride to volatilize lithium chloride. LiCl is condensed and collected in Cottrells. Tailings from kiln

are said to be a potential cement raw material. Drawback to method would be that end product is LiCl and it would be difficult to make into carbonate or hydroxide.

Another method calls for potassium bisulphate decomposition of concentrate to yield lithium sulphate, which is then leached from the melt. Obvious drawback is that bisulphate will dissolve substances other than spodumene.

Patent No. 2,727,452 issued to G. L. Cunningham, Cincinnati, Ohio, and assigned to Scientific Design Co., New York City, called for heavy media separation of quartz, mica and feldspar. Media is set at 2.9 specific gravity with water and ferrosilicon. Underflow from separator contains spodumene and iron minerals. Underflow is dewatered and roasted at 900-1,000 deg C to convert alpha spodumene to beta and to decrepitate the spodumene. Magnetic material is removed by magnets; ore is then wet ground and mixed with 40% calcium chloride and limestone.

Mix is roasted again at 1,100-1,200 deg C to volatilize LiCl. Concentrate of 40% LiCl is collected in wet dust collectors and a KCl product and a cement raw material are also produced.

In all the roasting methods described, a cement raw material is obtained from the kiln. At the present time none of the roast refiners is in the cement business. All have or are considering the possibility, but cement is a local market item (about 200 mile maximum shipping) and unless a large scale demand for cement develops in the Southeast or in Texas, none of the producers will be able to take advantage of the almost cost-free raw material.

Refining processes whose end product is LiOH are either limited to the sale of that compound or forced to make the difficult and expensive reconversion to the carbonate, from which all the other lithium compounds are normally formed.

Refining methods that have LiCl as end product are applicable for metal and metal derivative production, but not for carbonate. If metal and its derivatives are desired it is cheaper to go directly from spodumene to the chloride rather than spodumene-carbonate-chloride method.

Refining methods that have $LiSO_4$ as end product can go on to make all of the compounds now available. LCA's acid roast yields lithium sulphate, which can be carbonated to yield Li_2CO_3 or converted to LiOH with CaOH. From the carbonate, lithium chloride is produced by reacting the carbonate with hydrochloric acid. If lithium bromide is desired, carbonate is treated with hydrobromic acid. If lithium fluoride is desired then hydrofluoric acid is used.

Buyers

American Potash—only lepidolite

Lithium Corp.—spodumene, lepidolite and petalite.

Maywood — hand-picked spodumene and amblygonite

Foote — spodumene, lepidolite, petalite and amblygonite

Corning Glass Works — spodumene and lepidolite

Owens Corning Fiberglass Corp. —spodumene

National Enamel & Stamping Co. —spodumene

Pittsburgh Corning—lepidolite

General Electric—lepidolite

Making the Metal

Metal and the metal derivatives are produced from LiCl. Method currently being used by LCA and Foote Mineral involves electrolytic reduction from a fused salt of LiCl and KCL. 98% pure LiCl is mixed with KCl in a 60:40 ratio. Salt must be water-free. Bright iron cathode and a graphite anode are used. Recovery of the metal, 98% pure at best, is better than 95% at 90% current efficiency. Cell is operated at 450-500 deg C.

Another method tried on a laboratory scale called for pyridine to dissolve the salt. Method claimed better current efficiency and lower operating temperature.

At one time the metal was produced by vacuum reduction at 900-1,000 deg C. Lithium carbonate was calcined to yield Li_2O, which was then decomposed in vacuum again by magnesium metal, aluminum metal, silicon metal or ferrosilicon to yield lithium.

When lithium metal better than 98% is required, the metal must be refluxed in vacuum to drive off the sodium and barium impurities. When purity must exceed 99.5% recovery of metal will drop to 60% of the LiCl used in electrolytic reduction. Material of this nature was produced at Oak Ridge in connection with the stable isotope program, according to Minerals Yearbook (1953). Metal is covered with argon gas-seal and evacuated before distilling out Na and Ba at 850 deg C. After cooling, pure metal is poured into pure kerosene to protect lithium from atmosphere.

Lithium exists in two isotopic forms. Lithium-six, Li^6; and lithium-seven, Li^7. Method being used to separate the isotopes is not public knowledge. However, four rather expensive methods have been used to separate the isotopes of other elements. Thermal diffusion, gaseous diffusion, centrifugal and electro-static separation have been utilized to prepare concentrated forms of the given element being investigated. If lithium isotopic separation parallels uranium isotopic separation, as discussed in *E&MJ* September 1945, Vol. 146, No. 9, then one of the four methods could be used.

Lithium hydride is produced by reacting lithium metal with hydrogen gas at 700 deg C. Lithium deuteride is probably made the same way, with deuterium replacing the normal hydrogen, but only under AEC allocation.

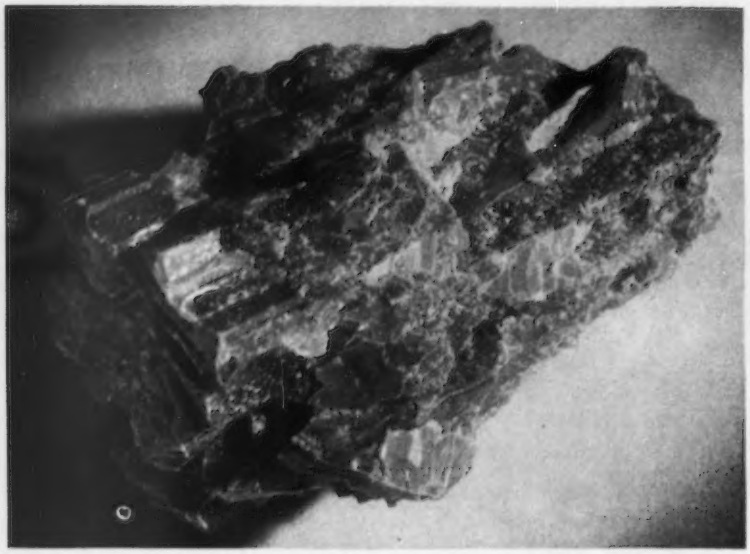
Hydride can also be made by reducing Li_2O or LiOH with aluminum or magnesium under slight hydrogen pressure. Metal Hydrides, Inc., has plant capacity to produce about 5,000 lb of metal hydrides a day, but normally produces only about 100 lb of LiH a day. Other lithium producers have much larger capacity and Metal Hydrides does not consider itself to be in the lithium hydride business, so much as the metal hydride business.

Lithium aluminum hydride is produced by reacting lithium hydride with aluminum chloride. About 75% of the available LiH is lost as LiCl during the reaction. L. W. Davis of Metal Hydrides stated that the aluminum hydride is used as a strong, but selective, reducing agent in the production of fine organic chemicals. Several hundred pounds a week are produced at Beverly, Mass. However, many of the reactions of $LiAlH_4$ can be produced by using the less expensive lithium metal.

Lithium aluminum deuteride is an isotopic analogue of $LiAlH_4$ and can be obtained only upon AEC allocation.

Lithium borohydride ($LiBH_4$) is made in a manner similar to $LiAlH_4$. It is used as an intermediate reducing agent between $LiAlH_4$ and sodium borohydride.

Lithium diborane is produced by reaching $LiAlH_4$ with anhydrous borohalides or alkyls.



LITHIUM DEUTERIDE described at Geneva as an ingredient in fusion reaction. Once a war-time secret, now, possibly the key to unlimited peace-time electrical power.

Versatility—Key to a Bright Future

ALTHOUGH LITHIUM PRODUCERS consider industry and "peace-time" uses the major basis for their expansion ("better than 80%"), the nuclear and defense applications of the versatile mineral cannot be ignored at a time when atomic progress is "hot" news.

The facts about lithium in this nuclear age are not being divulged by Government sources. But the Government is interested in lithium. And, judging by the quotes in the column at the right, it has been for some time. Some ancient guesses are now accepted despite official confirmation or denial. Some newer guesses remain just that, even though they may be backed up by probable theory and textbook documentation.

More than a score of technical and non-technical publications have said, in effect, "Lithium is used to produce the hydrogen bomb," while officialdom neither confirms nor denies. But the scientific journals say that when a lithium atom is bombarded with a neutron, it forms helium and tritium, which reacts with deuterium to produce more helium and release great amounts of energy, in either radiation or kinetic form. This is the fusion reaction, source of the H-bomb's power and (according to Geneva's star performers), the possible source of safe, low cost, unlimited power for a brave, new world.

Lithium deuteride (which has a high neutron capture cross section) has been investigated also as a possible shielding device for fission reactors.

Lithium metal has been considered as a heat transfer agent for reactors, but its reported high cost and corrosive nature have presented serious drawbacks.

In the field of propulsion, lithium is described in textbooks as being capable of releasing heat in amounts equal to 4,000 tons of coal per pound of metal when used as a solid fuel. Industry spokesmen say that commercial applications do not seem likely so far.

There have been published discussions of lithium metal's use in underwater propulsion (for torpedoes and submarines) and rumors of a use of some form of lithium as a fuel or as a component of a fuel for rockets and missiles. Again, textbook study certifies the possibility, but no concrete information is available.

As discussion of the development of a fusion reactor grew, and reports noted that, if it could be made operative, it would be a "safer neighbor" than a fission reactor; would be lighter (and therefore more adaptable for aircraft and other power plants) and would have almost unlimited sources of supply, observers wonder about the future of fission reactors and their fuel, uranium.

Said *Time* magazine, "If a fusion reactor should turn out to be successful, the booming uranium mining industry would be threatened with infant mortality." But L. G. Bliss, sales vice president of Foote Mineral Co., notes more calmly that when present obstacles are overcome, "it could well be that lithium will become a friendly rival of uranium." Builders and designers of fission reactors are going ahead with their plans, finding assurance in the Geneva statement of the "more than 20 years" required for development of the fusion reactor.

Obstacles mentioned by Mr. Bliss are underscored by nuclear energy experts, who note the tremendous investment which the U.S. has in uranium.

And lithium producers continue to study and expand their outlets in the major consumption areas of ceramics, greases and chemistry.

In ceramics, one of the principal consumers, lithium compounds are used to prepare ground coats, frits

and color coats. Li provides better shock resistance, superior acid resistance and permits lower fuel costs because less firing time and lower firing temperatures are required.

Latter quality permits use of lighter-gage steel and has spurred investigation of the potential use of ceramic coated aluminum in household appliances and architectural application.

Radio and television tubes and screens use lithium compounds, as do special glasses, glazes, enamels and dental cements.

Direct use of lithium-bearing minerals is also common in glass and ceramics. Amblygonite is sold in 1% plus 325-mesh air floated condition to produce opal, flint and alabaster. Lepidolite, when cleared of chrome and iron (to prevent discoloration) is used to make Pyrex ware. Petalite, also available in 1% 325-mesh, was consumed in the glass and whiteware field in 1954 to the tune of 10,000 tons. Spodumene goes into ceramics, glazes and enamels.

In greases, probably tied with ceramics as a top user, lithium stearate inclusion permits a wide operative range. Military equipment, still believed to be one of the top consumers, took advantage of its stability, viscosity in temperatures ranging from minus 60 to 320 deg F during World War II in all theaters of war. One research program now underway is said to be concerned with a liquid lubricant using lithium stearate.

Many industry figures look to the stearate use for lithium's greatest "peacetime" growth. Its future in America's gigantic civilian transportation seems unlimited, now that early obstacles are being removed.

In metallurgy, lithium compounds act as oxide scavengers and metal cleaners for welding of aluminum and magnesium; as degasifiers in smelting and refining, as component in aluminum, lead and copper alloys, such as Bahnmetall; and, in vapor form, to prevent corrosion and scale formation of metal parts during heat treatment.

In storage batteries of the Edison alkaline type, hydroxide is used. Principal use is in submarines, telephone installations and emergency electrical sources for railroad signals and telephones.

Other uses include air conditioning and refrigeration, cosmetics, de-icing fluid, pharmaceuticals and organic reactions, hydrogen generation, photography and non-yellowing laundry bleach.

The press reports on fusion...

TIMELINESS OF THIS ARTICLE is pointed-up by announcements and published rumors concerning lithium, lithium deuteride and controlled fusion immediately before and at the Geneva United Nations Atoms for Peace Conference. The "smoking-out process" began on July 25th when *Time* magazine said:

". . . A controlled fusion reactor has been or may soon be achieved . . . AEC officials refuse . . . to answer questions touching remotely on the subject. A beam of electrons from a linear accelerator . . . if focused on a small spot . . . will raise the temperature of that spot to many million degrees.

"No material can stand such heat, but if the material struck by the electrons is lithium deuteride, it will (so say the rumors), turn into helium, giving off a vast amount of energy."

Then, further information on the controlled fusion reaction began to come out of Geneva.

". . . **Dr. Homi J. Bhabha** (Indian physicist and president of UN Atoms For Peace Conference), freely said that a special form of lithium . . . could be used in a hydrogen bomb reaction . . . the best reaction would be with the double heavy form of hydrogen, deuterium . . ." *N. Y. Herald Tribune.* August 12, 1955.

". . . **Dr. Bhabha's point** about the special atom smashers was that they could create the enormously high temperatures necessary to fuse hydrogen atoms with lithium atoms . . ." *N. Y. Herald Tribune.* Aug. 13, 1955.

". . . **To release energy by fusion** (as it is released in the H-bomb) for industrial use is absurdly impractical. Physicists . . . must first of all find a way of generating the heat required for fusion without exploding a mass of uranium or plutonium . . . Bhabha's confident prediction . . . was more a romantic hope than a justified deduction from what is known of the fusion process." *N. Y. Times* editorial Aug. 15, 1955.

The lithium reactor "would have great advantages: . . . fuel would be cheap in terms of energy yield . . . no radioactive fission products . . . radiation might be comparatively easy to handle . . . less hazardous." *Time.* July 25, 1955.

". . . **Deuterium** was the only substance which was mentioned by Lewis L. Strauss (Chairman of AEC) as a possible raw material for fusion power . . . explosive in the hydrogen bomb is a chemical compound of deuterium with an isotope of the common element lithium." *Wall Street Journal.* Aug. 12, 1955.

". . . **Atomic fusion program** is further along than announced . . . Highest confidence seems warranted in the project's success . . . and sooner than the 20 years mentioned at Geneva . . . Senator Clinton Anderson (D-N. M.) is right when he says the project was kept secret to avoid scaring the American investor. The AEC will continue underplaying its (fusion reactor) importance. It does not want to discourage building of 'orthodox' atom-splitting electric power plants, nor the search for uranium to fuel them." *Wall Street Journal.* Aug. 18, 1955.

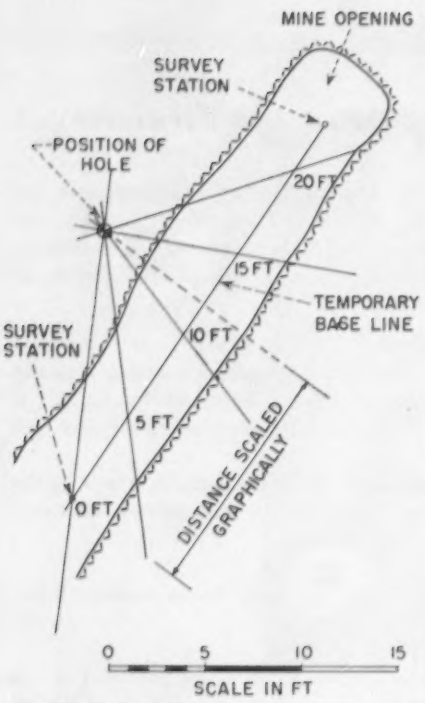


FIG. 1. BEARINGS PLOTTED ALONG survey station lines indicate position of deviated hole.

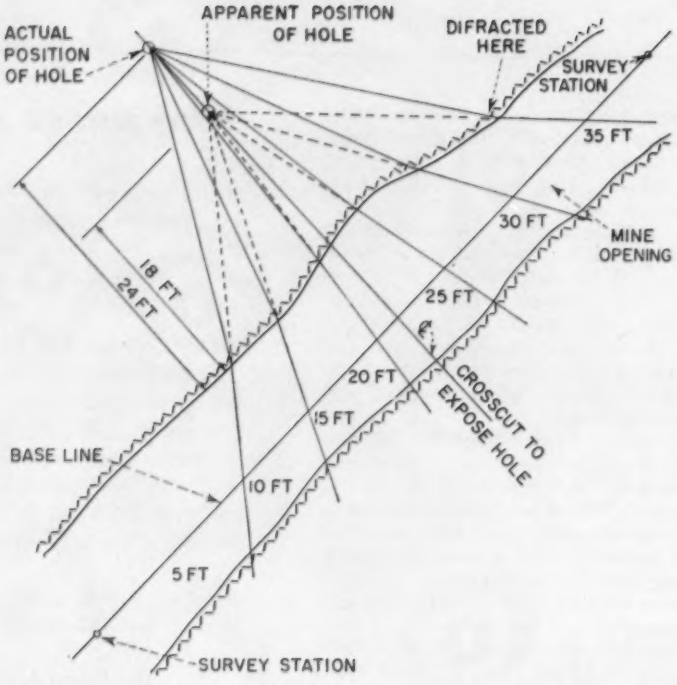


FIG. 2. DUE TO DIFFRACTION OF RADIO WAVES in rock and air, position of the hole will be outside plotted position, but in same plane.

How Radio Locates Drill Holes Underground

ROBERT P. CORBETT
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Kelley mine, The Anaconda Co.,
Butte, Montana

APPLICATION OF THE RADIO DIRECTION FINDER PRINCIPLE has eliminated probe drilling, sounding and the use of deep-colored dyes in water-filled holes as a means of locating deviated drill holes. This rapid, reasonably precise and cost-cutting method is finding lost diamond and churn drill bottoms at Kelley mine, Butte, Montana.

Diamond drill holes for drainage are usually drilled from one accessible drainage working to another. Churn drill holes from the surface are drilled to accessible workings underground; serving the two-fold purpose of prospecting and opening-up for later introduction of air, concrete liners or electrical cables.

Both types of drills require careful and accurate setting for a successful holing to the target opening. Even with careful setting a drill may deviate. One way or another the deviated hole must be located. Once the location is known the hole can be exposed by removing ground in the proper place with a minimum of expense and delay.

First Try

It was the failure of such a hole to connect in the Kelley mine that led to the conception, construction, trial and success of the radio direction finder method for locating deviated hole bottoms.

As part of the Kelley drainage system, two parallel NX diamond drill holes were drilled from the 600 level to a small crosscut south from the end of the main shaft on the 1100 level. Vertical distance was 455 ft. The first of these two holes was drilled and holed to the target with a surveyed deviation of only two feet.

Unfortunately, the degree and direction of deviation of one hole may have little or no bearing on another drilled adjacent or in similar ground. The second hole, which was offset two feet from the first and on same dip and strike, did not hole target after drilling to proper depth. The usual test holes, soundings and dye tests gave no clue as to the whereabouts of the hole on the 1100 horizon. It was at this point that radio direction finder method was conceived and tried. Bureau of Mines test at Mammoth Cave in 1929 gave us the basic information.

Assisted by the mining engineering department of Anaconda Co., we tried the following method: A radio signal was introduced into the bottom of the drill hole and bearings taken on the source of the signal at the target level horizon by means of a radio direction finder. Bearings were plotted on a simple sketch and the point of intersection of the bearings gave the point of origin of the signal; and the location of the drill hole.

On the basis of this information, ground was removed at the point indicated and the bottom of the hole exposed. Hole had deviated about 15 ft into the crosscut wall.

Since this first trial, more than a dozen holes have been successfully located in drift and crosscut walls. Deviations from 8 in. to 24 ft have been located. In several instances crosscuts were driven to intersect holes at intermediate horizons simply by following the directions as indicated by the rotating loop antenna on the receiver.

Transmitter Is Small

Transmitter used at Butte is a single tube, self-excited oscillator employing electron coupling. Comparatively low frequency signal is used. Tuning circuits of the transmitter operate on any frequency from 200 to 500 kc. This frequency was chosen since it required only minor modification of readily available equipment.

Transmitter, small, self contained and weighing only a few pounds, is powered by 6 volt battery or four No. 6 dry cells in series. Vibrator supply furnishes plate voltage. About 250 volt dc is required. Output of vibrator supply is unfiltered so that the 180 cycle frequency of the vibrator modulates the radio signal at the same frequency, making it audible and easy to identify.

Effective power of the transmitter is 3 or 4 watts. Radio frequency energy generated is capacity-coupled to a wire, one end of which is lowered to the bottom of the drill hole. Wire serves as antenna and introduces the signal into the target area. Single conductor rubber-covered telephone wire has been used as antenna and has been lowered into holes 800 ft deep. Insulated wire is required to prevent leakage of signal to ground, since most of the holes are damp or water-filled.

Receiver is battery-operated broadcast set with some minor modifications. Modifications include the shielding of the entire receiver in an aluminum cabinet, extending the tuning range to include those used in the transmitter, the addition of a rotary loop antenna and earphones to exclude noises commonly encountered underground. Loop, about 10 in. in diameter, is shielded and balanced to ground in order to eliminate anti-Marconi effect, which would impair the directing characteristics of the antenna.

Method

In practice the antenna wire is lowered to the bottom of the drill hole. Transmitter is then coupled and turned on. Once in operation no further attention is required during the survey. At the target area the signal is tuned-in on the receiver and a short base line is established.

Base line is usually established with reference to a mine survey station or is actually connected between two stations when possible. At points along the base line the directing loop of the receiver is rotated to determine the bearing of the signal coming from the antenna in the drill hole. Rotation of the loop through 360 degrees gives two points of maximum response and two null points. Null points, sharper than maximum position, are used to plot bearing.

Since the loop gives the bearing of the signal and not the direction from which the signal is coming several bearings are taken along the base line to fix the signal. Common intersection of all bearings indicates hole.

From the point of common intersection a perpendicular is drawn to the base line so that the distance from the base survey point to a point directly opposite the hole can be determined. It is along this line that excavation is made to the drill hole.

Equipment and method have proven valuable and yield considerable savings in recovery of deviated holes. Results have been successful in the Butte district granite and in the limestone and chert in the Conda, Idaho, operations of the Anaconda Co. A minimum amount of interpretation of data or calculation is required after the survey is completed. Holes were drilled into the crosscut walls and intersected the deviated hole at the position indicated by the survey.

Range Is Definite

Water-filled holes or those in the vicinity of metal-bearing veins or faults present no problem. Experiments conducted to date show a practical and definite range for the method owing to the high degree of absorption of the radio energy by the rock.

Amount of absorption depends on rock conductivity, permeability, dielectric constant and the frequency of the signal. Maximum range of the equipment and frequency used here at Kelley is about 40 ft. Waves of much lower frequency would undoubtedly yield better results.

Owing to the difference in velocity of radio waves in ground and in air, some degree of diffraction of the signal occurs at the disconformity or crosscut walls. Because of the nature of the medium through which the wave travels other diffractions and reflections are probably present. Holes appear to be closer to the mine face than is actually the case. (Fig. 2.)

This is academic, since the direction line to be followed to expose the hole is of primary importance. This line is normal to the base and indicates the shortest distance to the hole.

Inasmuch as an antenna wire is needed in the hole, drilling rods or tools must be removed from the hole. The method is limited to down holes or holes with sufficient dip to allow the wire to be lowered to the bottom.

In both churn and diamond drill holes cased with steel pipe this method will work, provided a short distance is left uncased at the bottom. Signal will not pass through pipe effectively•

More Data on EDTA Analysis of Cu-Pb-Zn

IN APRIL WE PUBLISHED an article by Jorma Kinnunen and Bertil Wennerstrand covering the rapid analysis of Cu-Pb-Zn and others. In response to the many requests for further information Mr. Kinnunen offers the following data on reagents and procedure. A bibliography of literature covering this method of analysis is available from *E&MJ* to those interested.

EDTA can be prepared by dissolving 18.605 grams disodium ethylenediamine tetra-acetate in one liter distilled water (0.05 N).

Buffer solution is prepared by dissolving 350 ml concentrate ammonium hydroxide and 54 grams ammonium chloride in one liter distilled water.

Manganese salt of EDTA is prepared by dissolving 0.02 mol manganese sulphate, 0.02 mol disodium ethylenediamine tetra-acetate and 5 ml concentrate ammonium hydroxide in one liter water.

Dilute 25 ml of this solution to 200 ml and add 20 ml buffer solution. Add 0.1 gram ascorbic acid. Titrate gainst Erio T with either 0.01 N EDTA or 0.01 N manganese sulphate.

Correct the main portion (975 ml) of this solution by adding equivalent amount of EDTA or manganese sulphate, depending upon the results obtained in the test titration. Add sufficient amount of the correct reagent to give stoiciometric solution of manganese salt of EDTA.

Iron determination is generally made on separate sample and step three is omitted from the procedure for Cu-Pb-Zn.

Step No. 4 has been altered as follows: After titrating copper add 20-30 ml triethanoline (1:1) and rapidly add 10-15 ml KCN and 10 ml concentrated ammonium hydroxide. Dilute to 300 ml with boiling water. Add ascorbic acid until nearly colorless. Add 5-10 grams ammonium fluoride; c ol and titrate Pb-Mn against Erio T with 0.01 or 0.05 N EDTA. Toward the end of the titration add 5-10 ml manganese salt or EDTA for better end point. Use electric light behind beaker for better visual end point control.

Alternate method to the above is to add ascorbic acid, until nearly colorless, to the hot dilute solution after decomposition (step No. 1) and then titrate hot for Pb-Mn-Ca-Mg with Erio T and EDTA. Cool and titrate Zn as in step No. 5.

Watch These Trends . . .

ZIRCONIUM CHLORIDE production by a new technique has been announced by Division of Industrial Chemistry of Commonwealth Scientific and Industrial Organization of Australia. Method is a modification of the Kroll process and is simple and applicable for small plants.

CRACK FREE CHROMIUM, a product of chrome plating research, is now available from United Chrome, Inc. Metal can be plated directly on steel without copper or nickel undercoat. The plate has excellent adhesion, low coefficient of friction, non-galling surface and superior ductility. Can be buffed to a high luster. Standard equipment is used. Plating speed is similar to conventional methods. Plate will remain crack free when heated to 1,000 deg F and plunged into water.

BAGASSE, a sugar refinery by-product, has been used successfully as a carbonaceous reducing agent in the smelting of Philippine laterites and serpentine ores. Absence of cobalt aids in the smelting to ferronickel. Tests were conducted on ore from the large nickel deposits of the Philippines by the Bureau of Mines.

ENAMEL WITHOUT ground coat or nickel flash has been tested successfully by Parker Rust Proof Co. and Frigidaire Division of General Motors. Called Parker Pre-Namel 410, this ceramic has been tested for two years by the companies and shows that cold-rolled rimmed steel and enameling iron can be enameled without coat. Thinner coats, stronger parts, less bowing, fewer rejects and reduced number of frits are additional advantages of the method.

LITHIUM BEARING enamels for aluminum are picking up speed in the industry. Several enamel-aluminum buildings are being tested at the present time. One lithium producer states that the first aluminum company to go into the enameled aluminum business will be going in on a large scale and will consume up to 5-million lb of lithium carbonate a year. To what extent this will add to lithium consumption or take away from present enameled steel business is not known.

LEADED STEEL use is on the upswing with machine tool men finding that leaded steel can be machined at speeds beyond present tooling capacity. Although competitors keep production rates secret, most shops are retooling to take advantage of the high speed machinability of leaded steel.

ALUMINUM PIPE for oil field use has been developed by Kaiser Aluminum & Chemical Corp. Designed for above the ground use, this pipe is so flexible that four 30-ft sections can make a 90-deg turn without elbows or special connections. Pipe is fabricated from rolled aluminum and seam welded. Priced slightly under steel pipe it weighs only about 1/10 as much. Can be installed in 1/6 the time as steel pipe and can save several hundred dollars a mile. New detachable coupling was designed to eliminate joint welding. Pipe can be flanged in the field with hand tools.

INDIUM anode is used in Elgin National Watch Co. newly developed micro-battery. Battery was designed for Elgin's electronic watch, which has not appeared on the market as yet. Battery is three times as thick as a dime and delivers 1.15 volts. Elgin feels that battery can be stepped up to 1.37 volts. Not available on the market. Battery will not leak, swell or gas. Will have other applications when available to the industry for use in hearing aids, radios and miniature recording devices.

SILICON, in extremely pure form, indicates cost reducing possibilities on a large scale for a new type rectifier developed by Bell Laboratories, Inc. To make the rectifier, a quantity of extremely pure silicon containing 1 part per billion impurities is impregnated with desirable impurities at high temperatures. Used in wafer form, rectifier has 5,000 times the capacity of conventional rectifier of the same size.

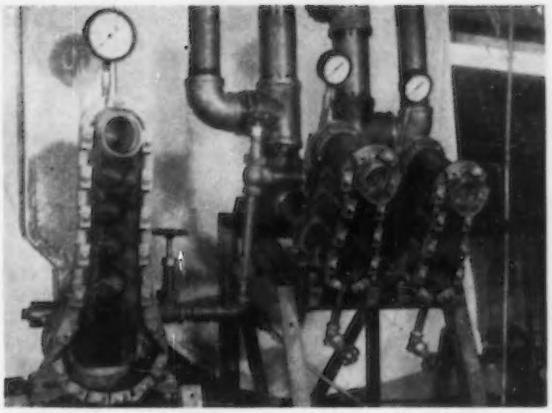
ALUMINUM PIG and aluminum foil 99.97% pure has been produced by Kaiser Aluminum & Chemical Corp. Available in pig or foil. Foil is used in radio and TV electronics industry. Also used in chemical and petroleum industry as catalyst.

HELIUM demand has increased so much in the past few years that Bureau of Mines has requested bids for a new helium-from-natural-gas plant. Nation's entire helium production is in the hands of the Government. Big reason for increased demand for helium has been increased use of titanium. Helium is used to protect molten titanium and keep out harmful gases while the metal it hot. Also used to protect many metals during welding operations.

STAINLESS STEEL and the nickel alloy, K-monel, will be used in Bell Aircraft's latest rocket plane, the X-2. The X-1 reached a speed of 1,650 miles per hour and an altitude of 90,000 ft. X-2 was designed of stainless steel to enable plane speed to reach 2,000 miles.

ALUMINUM OXIDE or silicon carbide mesh abrasive cloth called Gritcloth has been announced by Bay State Abrasive and the Amerotron Corp. Amerotron furnished the special rayon cloth, which serves as a base for abrasive sanding grits. Tests on production lines against conventional sand paper have shown significant cost reductions.

TITANIUM process, patented in England, can make titanium with about 1% oxygen. Patent holders believe that they can get oxygen content down to required 0.2%. Process, which can be made continuous, treats a mixture of magnesium vapor and purified titanium tetrachloride in argon atmosphere to yield titanium as a powder. Acetone is used to leach out any residual magnesium chloride. Pentane removes acetone and HCL is used to remove magnesium.



DISINTEGRATORS split mica scrap to one ten thousandth inch.

Mica Paper Process Cuts Costs

AFTER FIVE YEARS' development work, Integrated Mica Corp., Woodmere, N. Y., has announced that it has completed the design of new equipment to manufacture mica sheets of paper thickness at a price that will make it possible to substitute this for some of the better grades of paper now used in the electrical industry. It may also replace finer qualities of asbestos paper used for electrical insulation.

Advantage of the new product is that the new type of paper, made entirely from overlapping mica flakes held together by cohesion, will not burn at high temperatures and possesses good wearing qualities.

The paper is now being made in thicknesses varying from that of tissue paper to sheets an eighth of an inch thick. No imported materials are used in the new mica paper. Virtually inexhaustible supplies of mica scrap suitable for its manufacture are available in various parts of the country, particularly the western part of North Carolina.

Integrated mica was made as far back as 1942, but manufacturing was expensive. After the material had shown its value in industry, Integrated Mica Corp. set about designing new equipment that would make it possible for the new product to compete with other types of paper. Completely different equipment had to be designed, and it took five years to do the job. Chief of these are batteries of disintegrators, which operate with high-velocity jets of water to split the mica down to a thickness of less than one ten thousandth of an inch. Disintegrators are fed by the largest proportioning pumps ever built.

The machinery is of a massive nature and operates twenty-four hours a day and seven days a week. Whereas ordinary paper receives much of its strength and finish from pressure of heavy rolls which virtually iron it out, nothing like this is used in the Integrated Mica machinery.

The necessity for using numerous heavy steel rolls in the paper industry has made it extremely difficult to alter the thickness of the product readily. However, the many new inventions embodied in the Integrated Mica Corp.'s machinery make it possible to change the thickness of the paper in less than a minute.

A license to manufacture integrated mica has been granted to Ateliers de Constructions Electriques de Charleroi, Belgium, whose subsidiary, the Compagnie Generale Belge des Isolants, is now erecting a new factory especially designed for making integrated mica at Loth, near Brussels. The factory will be in production the early part of next year.

World Production of Bauxite, by Countries,

1950-54, in long tons[1] (Compiled by Pearl J. Thompson USBM)

Country	1950	1951	1952	1953	1954
North America:					
Jamaica (exports)	——	——	375,875	1,203,208	1,998,144
United States (dried equivalent of crude ore)	1,334,527	1,848,676	1,667,047	1,579,739	1,906,285
South America:					
Brazil	18,277	18,732	14,093	15,178	[2]14,800
British Guiana	1,583,428	2,002,757	2,387,953	2,261,166	2,300,000
Surinam	2,047,803	2,629,150	3,103,992	3,222,630	3,371,703
Europe:					
Austria	2,960	8,877	14,940	17,932	16,993
France	795,086	1,127,429	1,097,394	1,146,605	1,249,947
Germany, West	4,100	5,243	5,851	7,724	[2]6,900
Greece	76,225	193,948	343,087	325,526	[2]325,000
Hungary	563,362	722,410	1,153,494	[2]1,180,000	[2]1,280,000
Italy	150,962	171,266	261,353	267,930	290,423
Rumania[2]	1,000	9,800	9,800	12,500	14,800
Spain	11,994	10,414	11,512	5,106	4,626
U.S.S.R.[2]	738,000	837,000	886,000	886,000	984,000
Yugoslavia	202,807	476,048	568,082	455,009	669,850
Asia:					
India	64,400	67,047	63,505	70,848	[2]79,700
Indonesia	[2]320,500	[2]387,500	338,326	147,191	170,504
Malaya	——	——	21,796	152,171	165,622
Taiwan (Quemoy)[2]	——	9,800	2,900	4,900	1,000
Africa:					
French West Africa	9,965	——	108,017	332,760	439,208
Gold Coast (exports)	114,949	129,329	74,369	115,076	163,517
Mozambique	3,339	3,276	2,448	3,058	[2]2,900
Oceania: Australia	3,467	5,084	7,235	4,052	[2]3,900
World total[2]	8,050,000	10,675,000	12,525,000	13,425,000	15,475,000

[1] Table incorporates a number of revisions of data published in previous bauxite reports. [2] Estimate.

Mineral Industry Futures Can Be Predicted—II[1]

S. G. Lasky[2]

THE AUGUST 1951 ISSUE of *Engineering and Mining Journal* carried an article, under the title "Mineral Industry Futures Can Be Predicted," in which I gave the results of some studies made in 1949 on the future course of domestic production of copper, lead, zinc, aluminum and bituminous coal. These five examples were selected to test the thesis that the record of the past can provide an appreciation of the future—that each mineral industry has its own peculiar pattern of growth and decay "controlled by the progressive mutual adjustment of all the political, economic and technologic factors peculiar to it." Once the gross pattern is established, it is changed only by some factor strong enough to initiate a new cycle of growth, so that if one can determine the pattern of growth up to the present he has a good basis for projecting it into the future. Completion of the transcontinental railroads —opening up new markets and frontiers, and opening up Western deposits to exploitation—was the kind of factor strong enough to change the pattern and to start a new cycle. Technologic developments, such as open-pit copper mining or the flotation process, are not, although, to be sure, they help to determine the gross pattern if they come early enough. The concept and the technique of analysis were explained in the 1951 article, and the explanation need not be repeated here.

The August 25, 1952, issue of *Chemical and Engineering News* carried an article titled "Forecasting in the Chemical Industry" (by R. H. Ewell and Beth Scheuerman of the Stanford Research Institute) that discussed at length the application of the concept to industrial forecasting in general, with particular reference to the chemical industry.

The authors conclude that "the only approach to objective forecasting is the projection of past historical trends by one method or another." They preferred what is known as the Gompertz curve, for reasons that they give, whereas I prefer what is known as the Pearl-Reed curve or a modification of it that permits the calculated trend to hug the observed data, but this is a technical detail.

Five years have now passed since the studies were made that led to the predictions given in the *E&MJ* article referred to. How have the 1949 projections held up? Comparisons between projections and events are given in the following paragraphs and in accompanying charts. In addition, I have recalculated the several trends, taking the production record of the past five years into account, have improved the technique somewhat, and have made new projections. These results, too, are given below.

Bituminous Coal

The 1949 prediction was as follows:

"The plateau (of annual coal production) is at about 550-million tons . . . and it can be expected to stay there for a number of decades. Annual production may be greater or less than 550-million for long stretches of time, but it can be expected to average at that figure."

Actual production in the intervening five years has ranged from 534-million tons (1951) to about 390-million tons (est. 1954) and has averaged about 470-million tons. (See Fig. 1)

The new calculations point to interpretations virtually the same as the old, though perhaps more pessimistic in that they indicate that annual production at the plateau will average less than 550-million. Production over the next decade, as it recovers toward the plateau trend, is expected to average about the same as over the past five years—between 450-million tons and 500-million tons a year, perhaps closer to the lower figure.

The implication of these interpretations is that coal will presumably hold its absolute position but will not participate in meeting expanded demands for energy.

Copper

The 1949 prediction for copper was as follows:

"In general, the long-term 'production ceiling' seems to be just short of 750,000 tons a year."

In the five years since 1949, annual production has ranged from 943,000 tons (1953) down to about 825,000 tons (est. 1954) and has averaged about 905,000 tons.

New studies indicate that domestic copper production will fluctuate about a long-term trend level of, say, 800,000 tons. (See Fig. 2) This represents a mild correction of the old projection. The implication is that at times production will drop below the 800,000-ton level in order to compensate for periods of production above it. The immediate past has seen production well above the 800,000-ton level, and consequently production over the next decade may be expected to average as low as between 750,000 tons and 800,000 tons a year if there is to be a balancing out.

Those who are impressed with the high production over the past five years may look with disbelief at this prediction, yet to predict a long-term

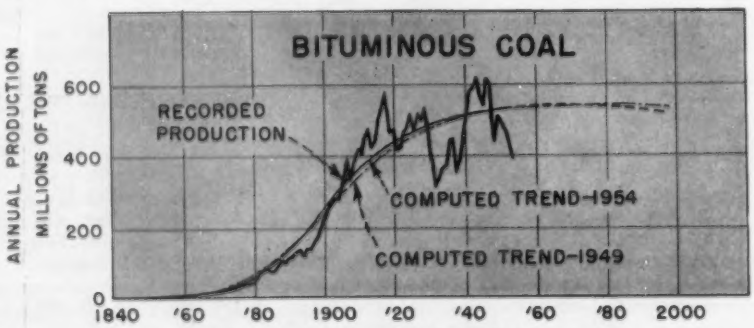


FIG. 1. Bituminous coal production is due for recovery.

[1]The opinions expessed herein are those of the author and do not necessarily reflect the official opinion of the Department of the Interior.

[2]Technical Review Staff, Department of the Interior.

trend much higher than 800,000 tons would appear to violate the whole trend of production up to now. It will be remembered that production was as low as 600,000 tons as recently as 1946, dropping from 1,100,000 tons in 1943, and was 760,000 tons in 1949.

Thus, copper, like coal, is expected to maintain its absolute position but not to participate in meeting the needs of an expanding economy. Part of the explanation for such an eventuality may lie in the expected large growth in store for the aluminum industry as described below—that is, copper may progressively be assigned to those uses for which it is uniquely suited, while more general demands may be taken care of by other materials, such as aluminum, that are satisfactory for the purpose but obtainable at lower price.

Aluminum

Aluminum was included in the 1949 study in order to test the usefulness of growth studies in assessing the future of a metal or mineral industry that is relatively young. In other words: How long does it take for such an industry to establish its pattern firmly enough so that the record of the past can be useful as a guide to the future? Lead had a statistical record of nearly 150 years, coal of 130 years, and copper 105 years, but aluminum had a record of little more than 60 years.

This short stretch of time, relatively speaking, was, for aluminum, long enough to give at least a general indication of the future. The 1949 prediction was as follows:

"The current (1949) annual production of about 600,000 tons can be expected to increase to an average of 1½-millions before the industry reaches (a plateau of production). *This prophecy, of course, makes no pretense of accuracy; it simply indicates the order of expectation.*" (See also Fig. 3.) The last sentence is italicized here because some readers of the original paper interpreted the prediction to mean that production would not reach higher than 1½-million tons and that any capacity created in excess of that figure would be surplus.

To the extent that it foresaw that the industry would grow several fold within the relatively near future, the prediction was valid, even though the growth was stimulated by the Korean war to a pace faster than had been contemplated. Production over the past five years has ranged from 720,000 tons (1950) to about 1,450,000 tons (est. 1954) and has averaged about 1,040,000 tons.

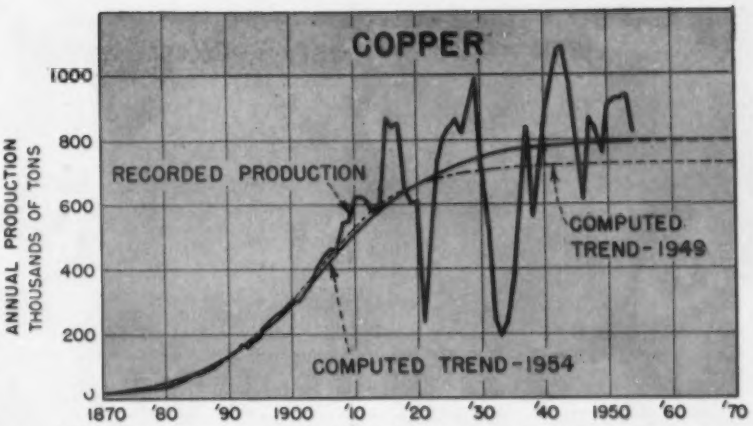


FIG. 2. Copper production may feel the impact of aluminum competition.

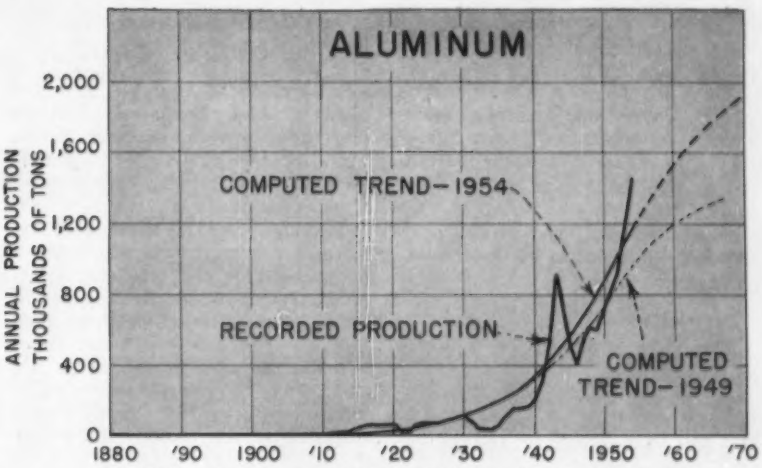


FIG. 3. Twenty years growth seems to be in sight for aluminum.

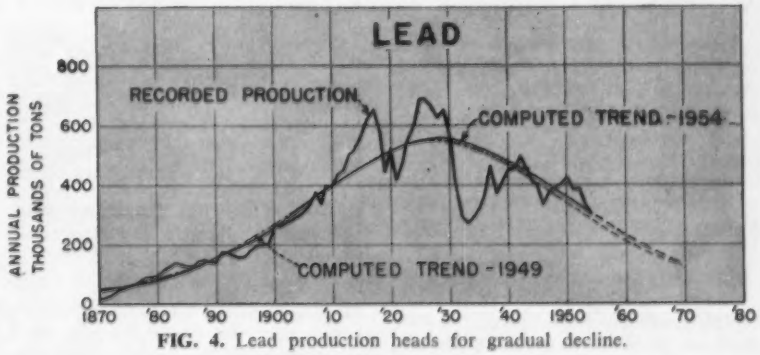


FIG. 4. Lead production heads for gradual decline.

The five years have helped to establish the growth pattern more clearly, and the current study indicates that production should eventually reach 2-million tons or more a year. It still seems that the plateau will be reached in the decade of the 70's or in the 80's. At least 20 years of growth seem to be in sight before the industry approaches maturity, regardless of what the level of maturity may turn out to be.[3] There is a good chance, however, that from now on the *rate* of growth will progressively decelerate.

The expected course of production is shown in Fig. 3. For the next decade, production is expected to average about 1.4-million tons a year, about the same as for 1954 and a little under the 1.6-million tons of capacity to be reached this year. An

[3]Editor's note: This manuscript was in preparation about eight months before the recent announcement by Reynolds and Alcoa to expand aluminum production.

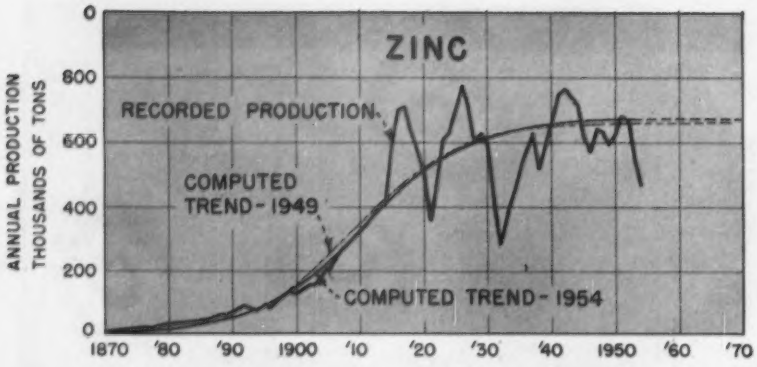


FIG. 5. Since 1949 zinc production has averaged about 600,000 tons per year.

average of 1.4-million tons connotes a peak production higher than that figure, so that if the prediction is valid we can expect new capacity to be built during the decade.

Until the point of deceleration is clearly determinable—the point of inflection on the annual trend line—the range of deviation from the projection may be greater than for the other, more mature, industries discussed herein, but the orders of magnitude given are expected to continue.

Lead

The 1949 prediction for lead was as follows:

"It appears that for the near term—the next decade or so—mine production can be expected to average between, say, 300,000 and 350,000 tons a year."

Actual production in the intervening five years has ranged from 430,000 tons (1952) down to 320,000 tons (est. 1954) and has averaged 370,000 tons, including renewed Government purchases made during 1954 for the expanded (long-term) stockpile and totaling, according to trade estimates, 60,000 tons.

The unexpected stimulation of the Korean campaign and of renewed purchasing for the stockpile, lifted production above the levels expected but had little effect on the trend. (See Fig. 4.) The new projection shows virtually the same downtrend as did that of 1949, though indicating a production over the next decade averaging maybe 20,000 tons a year more. Annual production for the decade 1949-59 is still expected to average between 300,000 and 350,000 tons; for the decade 1954-64 it is expected to average between 250,000 tons and 300,000 tons of lead a year.

Zinc

The 1949 conclusion was as follows:

"The maximum capability of the American zinc mining industry, on long-term balance or average, is at about 675,000 tons annually."

The charts that accompanied this conclusion showed that annual production could be expected to fluctuate about the figure of, say, 660 000 tons. In the five years since that interpretation was made, production has ranged from 681,000 tons (1951) to 460,000 tons (est. 1954) and has averaged about 600,000 tons. (See Fig. 5.)

The new study yields trend lines—annual and cumulative—that are almost identical with those computed in 1949. The low production in 1954 may have completed the process of cancelling out the abnormally high production of World War II—a process that was delayed by the demands of the Korean War—and, if so, annual production should rebound from the 1954 level. Over the next decade or so, it is expected to average between 625,000 and 675,000 tons a year.

World-Wide Guidebook Comments *(Continued from p 4)*

Would like 1956 Guidebook to cover metallurgy, milling and industrial, where metallurgical equipment is used. This is an excellent work, keep it up.

Howard L. Minister
Denver, Colo.

Exploration and milling should be covered next year. Your Buyers' Guide section is an excellent reference for young engineers.

M. A. Peters
Winchester, Mass.

This Guidebook issue has been of very good use to us in our planning and development programs.

Luis A. Perichon
Cordoba, Argentina

Present coverage is excellent. Perhaps special chapters on notable commodity developments can be added—similar to "Uranium Metallurgy Highlights."

W. F. Dietrich
Washington, D. C.

Please cover milling, mining and sink and float processes for manganese if possible.

Beceka Manganese
Brussels, Belgium

More exploration and mining. Would be interested in more articles like Fowler's, giving the philosophies and viewpoints of some of the well known successful exploration men.

David L. Kendall
Jefferson City, Tenn.

Please publish the Guidebook issue every half year.

M. Iijima
Tokyo, Japan

Outstanding! A continuation and improvement of this Guidebook will make your publication the "bible" of the mining industry.

A. E. Mills
Casper, Wyoming

Congratulations on a fine Guidebook issue. What about an issue summarizing Operating Ideas?

E. R. Arguelles
Monterrey, Mexico

An excellent and useful report. I note no suppliers of sampling equipment as such.

Deane F. Kent
Knoxville, Tenn.

More on mining, milling and metallurgy. I consider these Guidebooks very useful and with a great deal of valuable information.

W. R. Judson
Santiago, Chile

The Guidebook is certainly a wonderful reference and excerpts will be taken to be incorporated in our "Fundamentals of Milling" program. Hope we have more of these.

Herbert A. Hoffman
Bonne Terre, Mo.

Let's hear all about uranium, columbium, thorium, lithium, titanium, gallium, etc. In other words, the new mining fields.

Jesse L. Maury
Chevy Chase, Md.

I especially had an interest in the subject of ion exchange, so hope you will take it up again in the next issue.

Sigeharu Kawatuna
Ogita, Japan

Mining Guidebook is a dandy. If there is such a thing would like to see something on small gold and silver operations. That's all we have here.

Frank B. Bryant
Landusky, Montana

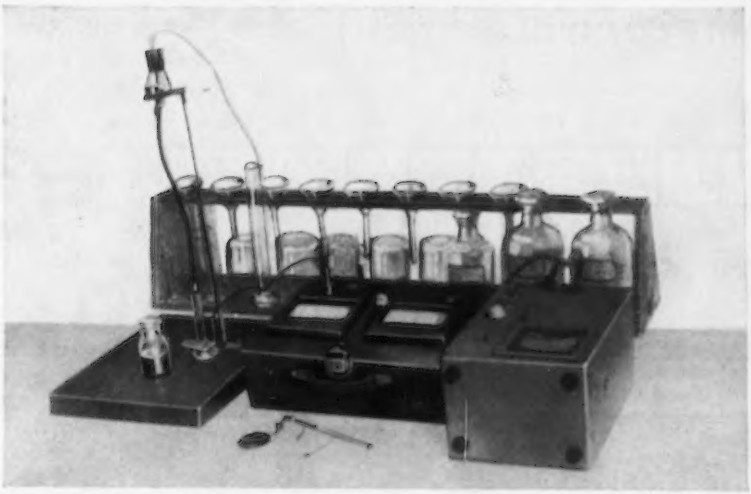


FIG 1. USING A POLAROGRAPH and microrecorder, a milling engineer can keep close watch on his flowsheet. Results for the whole plant can be obtained in 2 hours.

Comparison of Methods on Pb-Zn Ore

Sample	Zn Contents (percent) Chemical Analysis	Polaro Analysis
Hand picking waste	0.49	0.48
Hand picking waste	0.50	0.49
Hand picking waste	0.40	0.41
Flotation feed	6.61	6.68
Flotation feed	4.90	4.86
Pb concentrate	9.60	9.64
Pb concentrate	6.71	6.68
Zn concentrate	52.00	51.90
Zn concentrate	51.90	51.83
Zn concentrate	59.00	58.95
Zn concentrate	58.98	58.89
Flotation tailing	0.50	0.50

Polarographic Analysis for Faster And Better Mill Control

HIDEHIKO MINO
Chief of Mining and Dressing Department Research Laboratory, Mitsui Mining & Smelting Co., Tokyo, Japan

RAPID LOW-COST POLAROGRAPHIC ANALYSIS has replaced slow and costly chemical methods of mill control at Mitsui Mining & Smelting Co., Ltd. Use of a small, simple and compact portable model at our Takanosu property has cut sample-time to 15 minutes and sample-cost to 1/18th that of conventional chemical methods.

With properly prepared samples, we are using the instrument to make rapid-on-the-spot analyses of heads, tails, cell to cell concentrates and finished concentrates. In addition, the method has been used for geochemical prospecting, smelter and refinery control and for controlling waste discharge to prevent stream pollution.

Instrument is simple and easy to operate even in the hands of relatively unskilled technicians. More than two metals can be determined with the same sample and same reagents. Method as used by our laboratory was developed under the supervision of Dr. S. Tokunaga, manager of our Tokyo research laboratory and through the efforts of I. Shimizu.

Milling engineers have long desired a simple method, sufficiently accurate to estimate major metal content of a large number of routine samples. In order to control the operations and attain maximum efficiency and economy, they must have at hand the analytical data on mill products from the separate operations. Up to now, such data have been obtained in the assay laboratory by time-consuming, gravimetric and volumetric methods.

Data obtained by these methods are usually on samples taken several days previous and are useful only in providing information on the mill efficiency at the time the samples were taken. Because of the few analytical operations involved, several large companies are using spectrographic and polarographic methods; but the use of these instruments to determine major constituents of average mill products appears difficult. The spectrograph and the polarograph are complex and require skilled operators. However these instruments are extremely sensitive and are adequate for the determination of small amounts (10^{-6} to 10^{-7} moles) of various components of ores and mill products. Rapid determination of the major constituents of mill products such as copper, lead and zinc will provide data for plant operation.

In order to provide the data needed by the milling engineer rapidly, a rugged portable polarograph has been developed to analyze ores and mill products with high concentrations of copper, lead and zinc. Instrument also can be used to make such analyses in connection with geochemical surveys.

(Continued on next page)

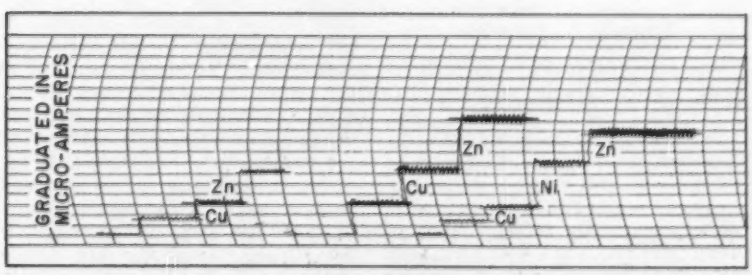
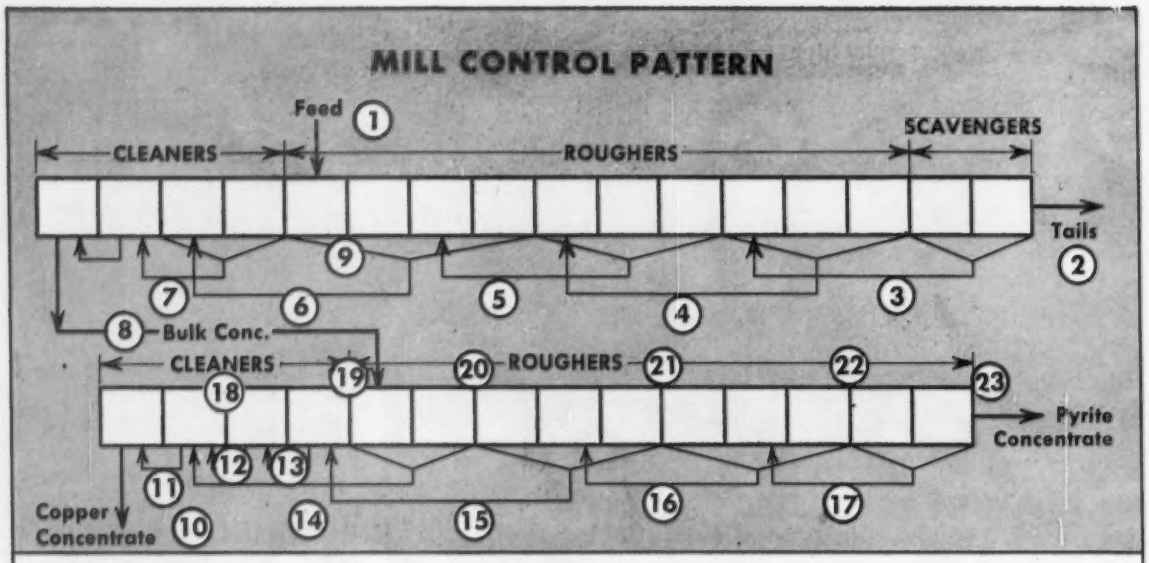


FIG. 2. PERMANENT RECORD of the result of each rapid analysis is made by microrecorder. Wave heights indicate diffusion current at various potentials.



LEGEND

Close mill control is maintained by sampling 23 places in the flotation plant. Rapid polarographic analysis yields following typical results in two hours. Results are in % copper.

1. Classifier overflow, 0.43
2. Tails, 0.11
3. Scavenger froth, 0.14
4. No. 3 rougher froth, 0.28
5. No. 2 rougher froth, 0.35
6. No. 1 rougher froth, 0.63
7. No. 1 cleaner froth, 0.70
8. Bulk concentrate, 0.79
9. No. 1 rougher cell froth, 0.70
10. Copper concentrate, 7.15
11. No. 3 cleaner froth, 6.45
12. No. 2 cleaner froth, 4.02
13. No. 1 cleaner froth, 2.68
14. No. 1 rougher froth, 4.12
15. No. 2 rougher froth, 2.14
16. No. 3 rougher froth, 1.25
17. No. 4 rougher froth, 1.16
18. No. 3 cleaner tails, 1.43
19. No. 1 cleaner tails, 1.36
20. No. 1 rougher tails, 0.52
21. No. 2 rougher tails, 0.61
22. No. 3 rougher tails, 0.36
23. Pyrite concentrate, 0.19

Efficiency and versatility of the polarograph has been proven by various tests. More than 30 instruments have been manufactured in the mining and dressing department of our Tokyo laboratory for distribution in Japan. One instrument will be sent to the Denver laboratory of the U. S. Geological Survey.

Apparatus consists of 2 main portions: an electrolytic cell and a box containing a current measuring instrument. The simply-designed electrolytic cell consists of a mercury container, a plastic tube, a capillary tube, an electrolytic cell and a metal stand which is fixed on the reverse side of the lid of the container box. Metal stand is designed to hold the surface of mercury at a height of 30 cm so that the apparatus can be set up easily and used in a limited space. Box containing the current measuring apparatus is 25x33x10 cm and weighs about 3 kg. Box contains a dry cell, a panel type microammeter, a voltmeter and a variable rheostat so that actual cathode potential can be measured regardless of voltage drop in the dry cell. Diffusion current is measured by the microammeter.

If it is necessary to prevent oscillation of the microammeter, caused by the dropping of the mercury into a solution of a high grade sample, the polarograph is equipped with a special condenser and resistance to dampen oscillations and thus facilitate reading the microammeter. Polarograph was originally designed and constructed to withstand inclination and vibration and meets the severe requirements of field equipment. Polarograph has a plug to connect with a microrecorder or a microammeter of high sensitivity. An arc-type microrecorder with the polarograph is shown in Fig. 1. The simple balance, which has a sensitivity of 10 mg, is kept inside the measuring box adjacent to the dry cell.

Sample Preparation

In general, high grade materials require greater care in sampling than lower grade materials. Most mill products are sulphides and hence are easily dissolved by aqua regia. One gram of the finely ground sample is weighed in a covered beaker and dissolved in aqua regia prepared by adding 2-3 cc of hydrochloric acid to 6-9 cc nitric acid. Mixture is heated slowly to complete solution, and the cover is removed to expel fumes. Heating is continued to expel excess acids and reduce the volume of the residual acid to approximately 2-3 cc. Then the volume is made up to exactly 100 cc with distilled water. Requisite amount of test solution, depending upon the grade of ore, is taken from the prepared solution and the excess acid is neutralized with ammonium hydroxide. To the neutral solution, 20 cc of 1:1 ammonium hydroxide containing 20% ammonium chloride; 10 cc of 10% of sodium sulphite solution; and 10 cc of 0.2% gelatin or CMC are added. Solution is then diluted with water to 100 cc. Aliquot of this test solution is used for the polarographic determination.

Volume of the test solution aliquot must be kept at a minimum in the copper determination so that the precipitated iron hydroxide does not disturb the determination of copper. If the sample contains 40 to 50% iron and 0.1 to 0.2% copper, a 20 cc aliquot of the test solution is necessary. If the sample contains up to 5% iron and from a trace to 0.6% copper, then 50 cc of the test solution is necessary. If the sample is a copper concentrate containing 20 to 30% iron and 20 to 30% copper, only 10 cc of the test

solution is used. In the determination of zinc, the test solution required is practically the same as for copper.

This simple technique requires about 15 min for relatively unskilled technicians to complete. To determine copper in river water, a 60 cc sample is used with the reagents as directed above. For this determination, a microammeter of great sensitivity is necessary.

Method

Standard solution containing 0.002 g each of copper and zinc per cc is prepared by dissolving 1 g each of pure copper and zinc in aqua regia and diluting to 500 cc. Five cc of this solution is added to 2 cc of 1:1 ammonium hydroxide containing 20% ammonium chloride; 10 cc of 10% sodium sulphite; 10 cc 0.2% gelatin or CMC; and the volume is made to 100 cc with water. Initially the polarograph is calibrated with a standard solution. Drop of mercury should be carefully adjusted to one drop every three to five seconds.

Instead of tracing a potential curve as in other polarographs, the wave heights for each element are determined by measuring the diffusion currents at 0.2 and 0.5 v for copper and at 0.8 and 1.1 volts for nickel; and 1.0 v and 1.3 v for zinc. For example the diffusion currents for the standard solution containing 0.01% copper and 0.01% zinc were measured at each potential with the following results:

Potential	Diffusion Current	
0.2 v	2.6 A	for Cu
0.5 v	5.2 A	
1.0 v	5.2 A	for Zn
1.3 v	10.2 A	

Diffusion currents at 0.5 and 1.0 v are the same provided that the solution being polarographed contains no metal ion which lies between copper and zinc in the electrochemical series. Wave heights for 0.01% copper and 0.01% zinc are obtained as a difference between the diffusion current values corresponding to each couple of potentials for each metal. For example, 5.2 minus 2.6 equals 2.6 microamperes for copper and 10.2 minus 5.2 equals 5.0 microamperes for zinc. The unknown test solution is treated in the same manner as the standard solution and the following typical values are obtained:

Potential	Diffusion Current	
0.2 v	1.8 A	for Cu
0.5 v	3.6 A	
1.0 v	3.6 A	for Zn
1.3 v	8.7 A	

Wave heights are obtained as follows: 3.6 minus 1.8 equals 1.8 microamperes for copper and 8.7 minus 3.6 equals 5.1 microamperes for zinc. Copper content of the unknown test solution is therefore 0.01 times 1.8 divided by 2.6 equals 0.00693% copper in the aliquot taken. To calculate the amount of copper in the original sample, the quantity found above is multiplied by 500 which equals 3.46%. Zinc content is calculated similarly, 0.01 times 5.1 divided by 5.0 equals 0.0102%. Calculating back one finds that the original material contains 5.1% zinc.

In determining copper in river water, the value of the copper obtained as above must be multiplied by 100/60. For field work, nomogram charts are convenient. Analyses of samples and the estimation of the values on the standard solutions must be carried out under identical conditions.

Fig. 2 shows that the diffusion currents obtained for copper, nickel and zinc are recorded by an arc-type microrecorder. Switch on the current measuring box is used to vary the sensitivity of the microammeter with different concentrations of metallic ions in the test solution.

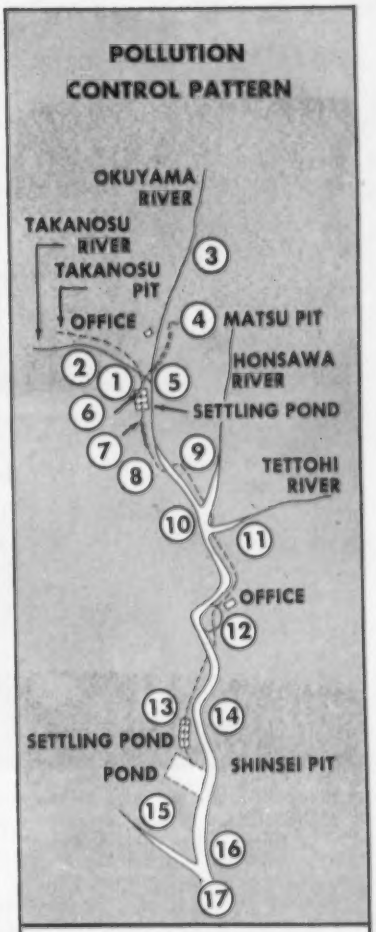
Application

Applying the polarograph to a flotation plant treating low grade cupriferous pyrite ore, analysis of 23 mill products from different flotation stages, containing varying amounts of copper, was completed in two hours. Flowsheet shows sampling stations and typical results obtained which have contributed greatly to improved rapid mill control at a low cost.

Polarograph has been used to analyze mine waters to determine danger of such water to vegetation and domestic animals. Copper contents of stream water at several points within four kilometers of our company's copper mine, where cement copper is produced from mine water, is plotted in the flowsheet above. All data were determined within one hour by polarographic method.

A polarographic analysis takes 15 minutes and costs 2.0 yen; while the same determination by usual chemical methods takes 5 hours and 35 minutes at a cost of 33.5 yen.

Comparison of the results obtained by both the chemical and the polarographic method for zinc in our Pb-Zn ore emphasizes the accuracy of the rapid method. The method is reliable even on high grade materials. Simplified polarography, which introduces high efficiency and economy to plant operations and geochemical surveys, may replace gravimetric-volumetric techniques.



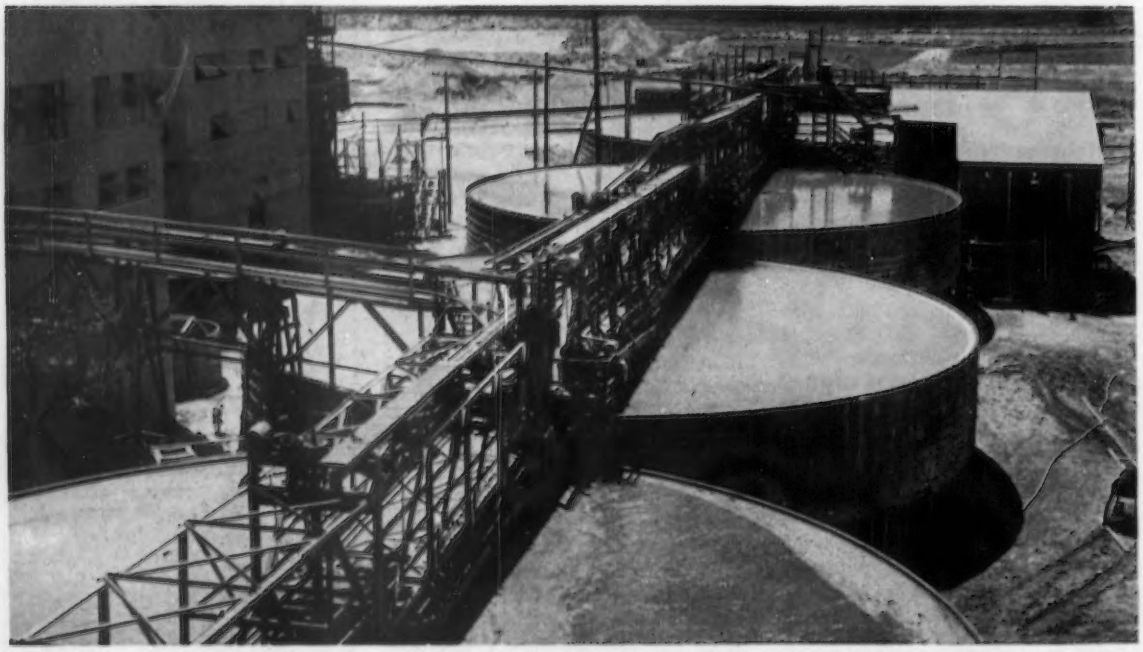
LEGEND

Close pollution control is maintained by sampling 17 points in cement copper precipitation flowsheet and the rivers surrounding the area. All samples are analyzed in one hour. Results are in grams copper/ton

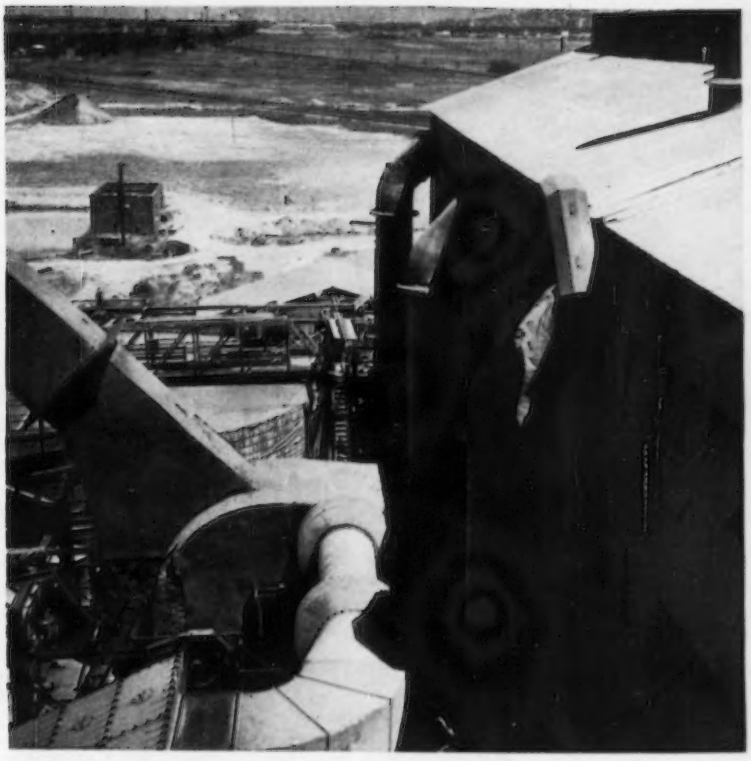
1. Takanosu pit mine water, pH 3.1; Cu, 1.8
2. Takanosu river, pH 6.0; Cu, trace
3. Okuyama river, pH 6.6; Cu, trace
4. Matsu pit scrap-iron cement-copper feed, pH 2.5; Cu, 12.5
5. Matsu pit cement-copper feed, pH 2.6; Cu, 10.5
6. Combined waters from Takanosu and Matsu pits, pH 2.8; Cu, 5.4
7. Settling pond discharge, pH 2.9; Cu, 3.6
8. Limestone treatment bed feed, pH 3.0; Cu, 3.2
9. Honsawa river water, pH 6.0; Cu, trace
10. Junction of rivers at mouth of Honsawa, pH 5.1; Cu, trace
11. Tettohi river water, pH 4.4; Cu, 1.89
12. Combined mine water, pH 3.1; Cu, 3.6
13. Settling pond, pH 3.4; Cu, 2.5
14. Shinsei pit, pH 3.3; Cu, 1.8
15. West branch river, pH 6.7; Cu, trace
16. Main channel river, pH 5.3; Cu, 1.2
17. Main channel below branch, pH 5.9; Cu, trace

BLENDING in the stockpiles in foreground and the silos next to mill is the first step in providing a uniform feed to mill. Blending keeps uranium content of the feed in 0.25-0.30% range and provides proper balance of mixed ores at all times.

Vitro's Keys to Successful



SEPARAN is the clue to uniform and rapid countercurrent decantation of the acid-leached ore. Overflow from No. 1 goes to sulphide step. Underflow from No. 4 goes to filters where the dilute liquor is recovered and sands go to tailing disposal.



ROASTING at 750 C makes refractory ores more soluble and improves settling time of sliming types. Dust collectors return value to process and keep mill dust-free.

Uranium Leaching

J. B. HUTTL
Associate Editor
San Francisco

VITRO URANIUM CO. is producing high grade uranium concentrate for the Atomic Energy Commission at four times their original design capacity. In overcoming the problems of converting from an alumina plant to a uranium reduction mill and the difficulties encountered in going into production after limited pilot plant background, this process is currently licking the problem of handling mixed ores ranging from refractory, sandstone and limestone to sliming types.

Here is the process that is being used at their Salt Lake City plant at the present time. Here is the process they expect to expand so that they can process Vitro Minerals Co. uranium ore from the Gas Hills district. (Uranium ore from Gas Hills is now being shipped to Salt Lake for processing.)

Plant is situated in southwest Salt Lake City, covers about 81 acres and consists of 17 buildings with a net area of 60,000 sq ft. Here, uranium ores of low vanadium content are treated by sulphuric acid leach for recovery of uranium oxide only. Plant feed is obtained from the Marysvale, Temple Mountain, San Rafael Swell areas of Utah, the Hidden Splendor, Four Corners, and Utex mines, and many small shippers. Principal mineral contained in the Marysvale ores is autunite. The ore is soft and easily slimed. It occurs as veins in quartz monzonite rock. Temple Mountain ore is a coarse conglomerate sandstone from the Shinarump formation with an asphaltic base and uraninite as principal mineral. Hidden Splendor ore is a becquerelite mineral, also from the Shinarump formation; while Utex ore is an altered uraninite mineral of medium lime content from the Chinle formation. Four Corners ore occurs in the Morrison formation.

All ores are purchased from producers at prices no less favorable to the miner than those published in the AEC Domestic Uranium Program Circular No. 5, as revised. Shipments arriving in Salt Lake City in bottom-dump gondola railroad cars are first routed to the Utah Ore Sampling Co. plant at Murray, Utah, for weighing, crushing to minus 1-in., sampling and moisture determination. Vitro pays for this service by the ton, with assay pulps delivered to the Vitro laboratory for analysis to determine metal content for settlement purposes. Other samples are sent to the producer, and two samples are held in reserve for possible umpire analysis should Vitro and the shipper not agree on a settlement assay.

Upon completion of crushing and sampling operations the ore is reloaded into cars for transfer to the nearby Vitro reduction plant.

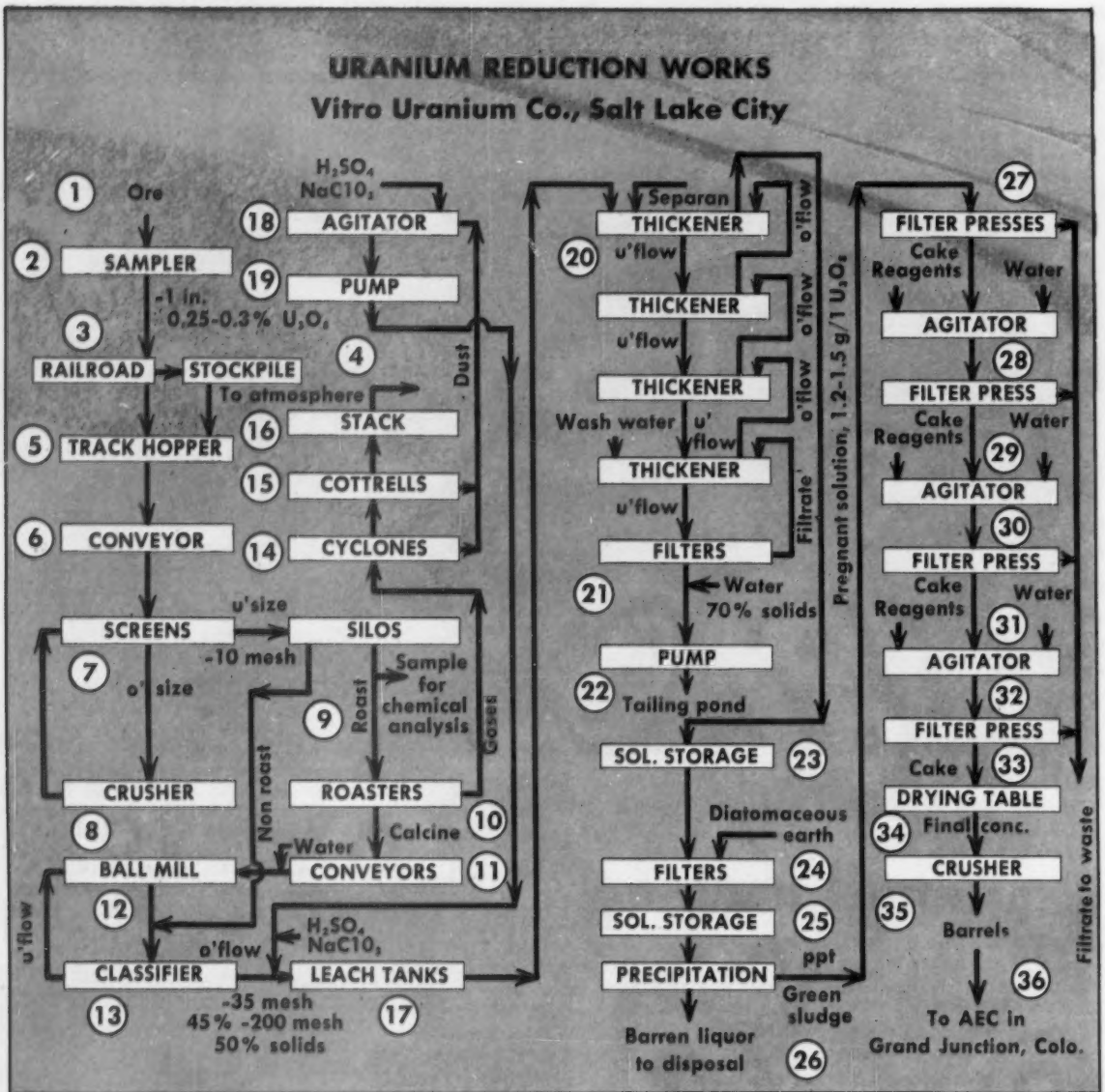
Method of processing the ore undergoes here may be broken down into five major steps:

1. Ore preparation, which includes crushing, roasting and grinding.
2. Sulphuric acid leaching.
3. Decantation, which includes thickening, filtration, and clarification, where liquors containing dissolved uranium are separated from pulp.
4. Precipitation, a reduction process wherein the uranium is converted chemically to a solid concentrate.
5. Filtration and refining, wherein the concentrate is further treated to remove impurities, and then dried.

Blending Is Essential

Cars from the sampling plant arriving at the Vitro reduction works can either be dumped direct into a track hopper, capable of holding 100 tons, or stockpiled on either side of the track. Majority of ore is handled direct to the track hopper, but in some cases the ore goes to stockpiles to facilitate subsequent blending and to maintain an adequate ore reserve. Various ores are blended to provide a plant feed of uniform grade, as well as for metallurgical reasons. For instance, some ores cannot be handled separately because of poor settling or filtering characteristics; while others, because of very sandy nature, may be difficult to handle in available pumps and lines. In general, plant feed assays from 0.25 to 0.30% U_3O_8. Ore held in the track hopper is transferred by a 30-in. belt conveyor to the crushing plant.

Reduction to minus 10 mesh is accomplished in a 30x30-in. Cedar Rapids impact breaker operating in closed circuit with four 4x8-ft Tyler vibrating screens at 10 mesh. Screens can be heated electrically to reduce blinding to a minimum when handling wet ores, particularly during the winter months. Screen undersize is stored in three vertical precast-concrete silos, two with a capacity of 900 tons and one holding 500 tons. These silos provide for segregating ores according to the particular



LEGEND

1. Railroad cars deliver ore from various mines to Salt Lake City and then to Murray, Utah
2. Sampling by Utah Ore Sampling Co.
3. Railroad back to Salt Lake City
4. Stockpiles for blending to average 0.25-0.3% U_3O_8 feed
5. Track hopper, 100-ton
6. 30-in. conveyor belt
7. Four 4x8-ft Tyler vibrating screens, 10 mesh, electrically heated
8. Cedar Rapids impact crusher, 30x30-in.
9. Three precast concrete silos, two 900-ton and one 500-ton capacity
10. Skinner 10-hearth, 20-ft-diameter roaster, 750 C, retention time up to 3 hours
11. Screw conveyors
12. 6x6-ft Eimco ball mill, 70% solids
13. Model C, Dorr-type rake classifier, 54-in., and a wet cyclone, o'flow to leach u'flow to regrind
14. Dry cyclones for gas clean-up
15. Cottrell precipitators for gases
16. 452-ft concrete stack
17. 12,000-gal leach tanks in series
18. Agitator to handle dust from cyclones and Cottrells
19. Pump
20. Four 70-ft Dorr-type thickeners for countercurrent decantation
21. Two American disk-type filters and two Eimco drum filters (150 sq ft)
22. Sand pump for disposing repulped tailings
23. Two 50,000-gal tanks to hold unclarified solution
24. Four Eimco precoat filters with diatomaceous earth added
25. One 50,000-gal and two 13,000-gal storage tanks for clarified solution from filters
26. Phosphate precipitation of uranium
27. Two 36-in. and one 30-in. plate and frame press filters
28. Hopper-fed agitators where reagents and water are added to up-grade cake from press filters
29. 30-in. plate and frame filter press
30. Hopper-fed agitator as No. 28
31. 30-in. plate and frame filter press
32. Hopper-fed agitator as No. 28
33. 30-in. plate and frame filter press
34. Drying tables with heating coils and infrared lamps
35. Crusher
36. Concentrate is placed in steel barrels for final shipment to AEC at Grand Junction, Colo.

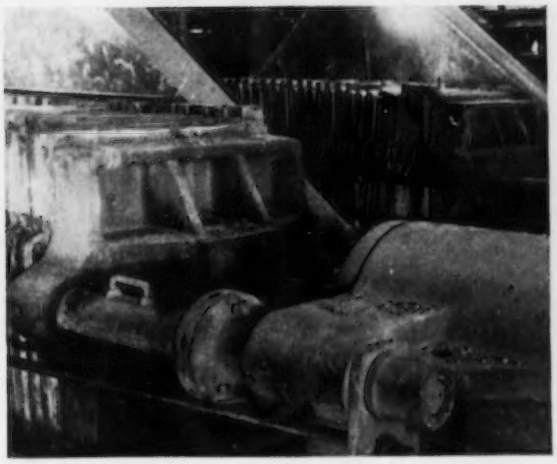


PLATE AND FRAME FILTERS recover uranium precipitate, which is further processed to a high grade finished cake.

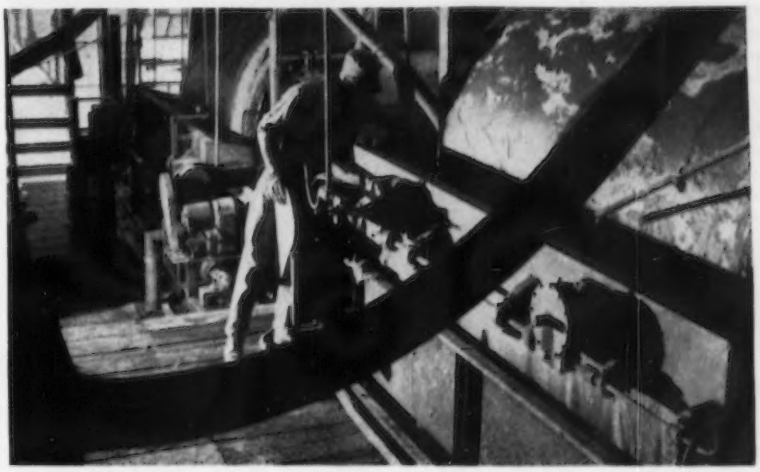
INFRARED LAMPS assist heating coils on the drying tables. Concentrate is crushed and put in barrels for delivery.

type—namely "roast" or "non-roast" ore, and for additional blending if desired. Temple Mountain ore belongs to the "roast" category and Utex, Hidden Spendor, Four Corners and Marysvale ores to the "non-roast" category. However, some "non-roast" ores are sometimes roasted to improve their settling characteristics, as this affects the counter-current decantation operation later on.

Roasting Is Critical

Ores stored in the silos can be fed by belt feeders and conveyors to the roasters or bypassed directly to the grinding circuit. Equipment in which the oxidizing roasting operation is carried out consists of three gas-fired multiple hearth Skinner roasters. They are 20 ft in diameter and contain 10 hearths. The "roast" ores are subjected to temperatures up to 750 deg C and retention time may be as long as 3 hours. Considerable care must be exercised when handling material considered "non-roast" for purposes mentioned previously. If excessive temperatures are maintained there is danger that the uranium may become insoluble. Important part of the roasting operation is to insure oxidation of the uranium mineral to the soluble hexavalent form.

Roaster gases carrying considerable dust are successively treated in dry cyclone units and Cottrell precipitators before being expelled into the atmosphere through a 452-ft high concrete stack. In view of the fact that uranium will concentrate some 5 to 10 times in the fine fractions of an ore, it is important that efficient dust control is maintained at all times, simultaneously eliminating a nuisance factor from the plant. Recovered dust goes to an impeller-equipped leaching tank to which calculated quantities of sulphuric acid and sodium chlorate are added. The resultant pulp joins the ground calcines at the head of the leaching department.



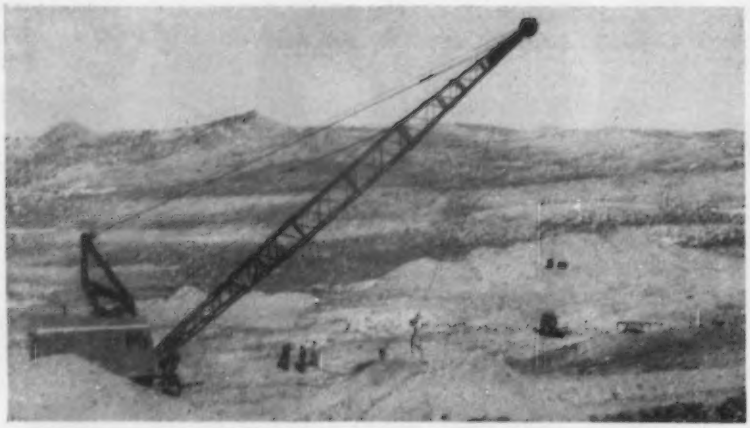
PRECOATING the drum filters with diatoms speeds-up filtration of the sulphidized liquor. Clarified solution goes to uranium precipitation after this last clean-up.

Calcined ore discharged from the roasters goes via screw conveyors to the grinding department for wet reduction to minus 35 mesh (about 45% minus 200 mesh). This is done by a 6x6-ft Eimco ball mill operating in closed circuit with a 54-in. Dorr-type duplex-rake classifier which is in series with a locally fabricated wet cyclone. Grinding is done at 70% solids, with the cyclone discharge, or final leaching plant feed, being maintained at about 50% solids. The uranium at this point is largely in hexavalent state.

Leaching is carried out in a series of acid resistant agitator tanks. Transfer of pulp from one tank to another is by gravity and pump. Each tank has a capacity of 12,000 gal and the rubber-covered, cast-steel impellers are 4 ft in diameter. They are operated at a speed so as to provide just enough agitation to keep the ground ore particles in suspension. Sulphuric acid is added to tank No. 1 and some sodium chlorate to tank No. 2 to effect efficient solution of values. Periodic samples are taken from each tank and sent to the laboratory for determination to maintain constant control on the leaching circuit.

Separan Aids Decantation

Separation of leached residues from the solution containing uranium values is accomplished in a 4-stage counter-current decantation circuit. Equipment available for this operation consists of four 70-ft Dorr-type thickeners and Dorrco diaphragm pumps. Tanks are of wood. Rakes and parts of the rake mechanism are rubber covered or made from stainless steel. Leached pulp enters the primary thickener at 50%



LARGEST earth-moving equipment in the industry handles ore from the Gas Hills.

solids and the underflow is pumped from thickener to thickener at 53 to 55% solids. Liquor decanted from each subsidiary thickener flows by gravity to the primary thickener. Wash water is added to No. 4 thickener, and Separan (Dow X-2610) is added to aid settling. Underflow from thickener 4 is treated in four filters; two American leaf type and two Eimco drum units (150 sq ft), for recovery of remaining soluble values. The 70% solids filter cake is pulped with fresh water and pumped to the tailings pond, while filtrate returns to thickener 4. Filters are operated in parallel.

Diatoms Assist Filtering

Pregnant liquor decanted from the primary thickener containing from 1.2 to 1.5 grams per liter U_3O_8 goes to two 50,000-gal storage tanks ahead of the clarification circuit, pending purification by a sulphidizing operation. Flake sodium sulphide is agitated with the liquor to prepare it for efficient precipitation of the uranium in the following precipitation steps. Specifically, it precipitates for the most part those sulphides leached from the ore, resulting in a final product of improved grade. Sulphide precipitate, together with any colloidal slimes carried from the thickener circuit, is removed by filtration through four Eimco precoat rotary drum filters. Diatomaceous earth is used as precoat material. Clarified liquor subsequently stored in three tanks, two 13,000 gal and one 50,000 gal, is sparkling clear and is ready for uranium precipitation as insoluble phosphate.

Precipitation process currently employed for treating the clarified liquor is done in a series of agitator tanks in conjunction with conventional plate-and-frame presses to recover the precipitate, which is a low-grade uranium concentrate. Low-grade is further upgraded by lime-cyanide washes.

AEC Declassifies Phosphate Reduction Described Here

The phosphate precipitation process is carried out on clarified pregnant liquors which have been previously treated with sulphide to remove undesirable impurities. The process is conducted in a series of agitator tanks on a continuous basis. Chemically the process is the reduction of uranyl sulphate (the oxidized form) to uranous sulphate, and combination with the phosphate ion to produce an insoluble uranous phosphate precipitate. Reduction is carried out by the use of powdered aluminum. Phosphate is then added in the form of monosodium phosphate, a solid. pH adjustment is attained in the last tank of the series before going to presses by the addition of basic wash waters from subsequent refining operations and a make-up of soda ash. The precipitate is pumped through three standard plate and frame filter presses with the barren liquor going to tails, and the cake being further treated with caustic and cyanide combination to upgrade the concentrate, and to remove undesirable impurities. Residence time in the precipitation step and temperature are closely controlled to give precipitation as complete as possible.

While the preceding steps were continuous, filtration of uranium-bearing precipitate is a series of batch-wise washings with intermediate filtrations, on plate and frame presses, to effect upgrading. Liquor from the precipitation storage tanks is passed through three presses (one 30-in., two 36-in.), with cake going to small 316-stainless agitating tanks below and the filtrate to waste. Cake, after digestion with reagents, is pumped to other presses with an agitator unit between successive presses. Filtrate from these presses also goes to waste. Purified cake from the last press, or end product, is dried on a large table equipped with infrared heat lamps and heating coils. Dried concentrate is crushed and barreled for shipment to AEC in Grand Junction.

Vitro Minerals Co. Mining in Gas Hills

EARLY IN JANUARY 1955, a new subsidiary, known as Vitro Minerals Corp., was formed. It is jointly owned by Vitro and the Rochester-Pittsburgh Coal Co., with Dr. C. J. Potter, president, W. B. Hall, vice president, and J. O. Horton, general manager. Original concept of Vitro Minerals was two-fold—namely, (1) to secure a part of ore supply for Vitro Uranium's reduction plant, and (2) take position in the uranium mining field regardless of location. Company now holds claims and is doing exploration and development work in the San Rafael Swell area in the east central part of the state of Utah, the Gas Hills area of Wyoming, near Riverton, and the Blind River district of northern Ontario in Canada. Other holdings in Colorado, Nevada and Washington are under investigation.

Activities in the Gas Hills district date back to the fall of 1954. Property under development is 55 miles east of Riverton and covers some 57 claims. It adjoins the well-known Lucky Mc mine. Open pit mining was started late in March 1955 and initial deliveries of ore to AEC's buying station at Riverton were made the following month. Current production is the largest in Wyoming. Surface ore is metagutunite, while that encountered below a 50-ft overburden is believed to be primary ore. Both types are radiometrically out of balance, making distinction between ore and waste somewhat difficult.

As a consequence, a crushing and sampling plant has been installed on the property to handle mine output prior to stockpiling and shipping. Plant rejects are stockpiled in small lots, and samples covering them are chemically assayed for grade. This procedure permits easy blending.

Ore deposit, deliniated by previous drilling, lies in a channel averaging 40-ft in width. Mining operations resemble those carried on at open pit coal mines. 50-ft overburden is removed by dragline equipped with a 70-ft boom and 2-yd bucket. Several types of loaders are being tested for loading ore into trucks for transfer to sampling plant or stockpile. Graded and blended ore is hauled to the AEC buying station at Riverton in 20-ton trucks. Operations are directed by Roy Coulson, superintendent.

J. O. HORTON, general manager

J. D. MOORE, chief process engineer

R. C. COLE, plant manager

Here are some of the men on Vitro's uranium team

W. B. HALL, general manager

M. T. ELLIS, plant superintendent

N. SHIFF, research leader

How Vitro Uranium Co. Was Formed

A VISIT TO VITRO'S Salt Lake City reduction works leaves a strong impression of the skill and perseverance shown by management and staff in solving the many problems, trials, and tribulations incident to convert with minimum delay a plant built during World War II for production of alumina from alunite ores into a dependable and efficient custom uranium ore processing mill. Much midnight oil was burned during the early stages of operation to improve and perfect a new process tested on a small pilot plant scale only and to fit existing plant layout and equipment into the intended flowsheet.

Vitro Uranium Co. is one of five autonomous divisions of Vitro Corporation of America headed by J. Carlton Ward Jr., president. It was formed in 1950 as Vitro Chemical Co., taking over in January 1951 the Kalunite Co. plant then held by J. R. Simplot, who had acquired the property for the purpose of establishing a fertilizer plant. Soon thereafter Vitro began to convert the idle plant into a uranium custom mill to process output from the new ore discoveries, made in 1949, in the Marysvale area of southern Utah. Although some of the available alumina producing equipment such as multiple hearth roasters and acid-proof leaching, filtering and other auxiliary units could be made use of, additional machinery was added to complete the flowsheet.

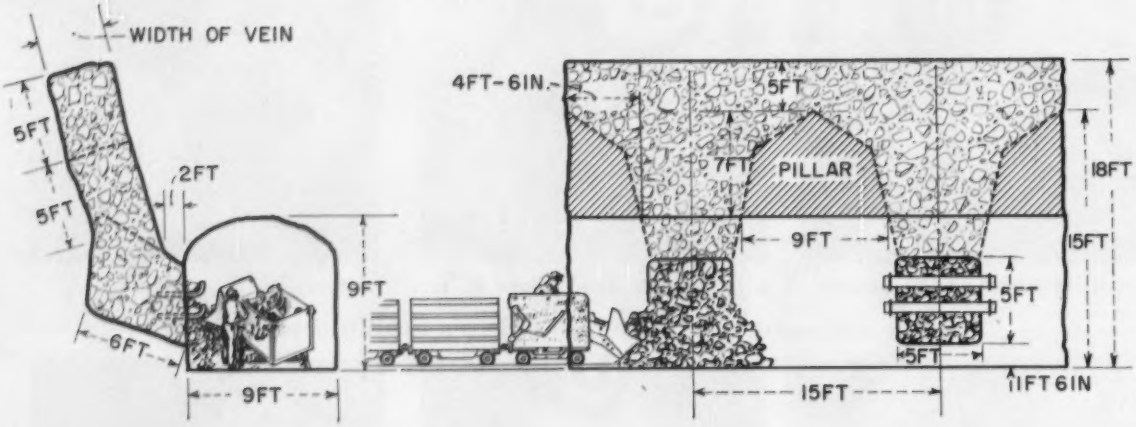
Plant was put on stream late in 1951, and since then its capacity has been expanded on two occasions to take care of increased ore shipments from the new uranium discoveries in the Moab, Temple Mountain, Muddy River and Green River areas of Utah, specifically the Steen, Consolidated, Hidden Splendor (Pick), and Four Corners mines; and some day perhaps take care of ore from mines now under development in the Gas Hills district near Riverton, Wyo.

First expansion program involving installation of four large thickeners, rearranging existing filtering capacity, and modernizing all ore handling, crushing and screening facilities at the head of the plant was completed in 1952. Difficulties experienced at this time with the uranous phosphate precipitation process were investigated and eventually overcome. Process had been developed by the Atomic Energy Division (AEC) at Oakridge, Tenn., for treatment of Marysvale ores, but trouble started when other types of ore were added to the plant feed. Recovery was adversely affected. To solve this and other problems encountered and improve uranium chemistry and metallurgy in general, the management set up a research department staffed by about 20 men. The second expansion program was completed in the fall of 1954, adding about 50% to the existing plant capacity. It called for additional crushed ore storage and handling facilities, activation of another roaster and expansion of appurtenant dust recovery units, both mechanical and Cottrell, and installation of extra leaching and precipitation equipment.

Present plant now has a capacity four times that planned in 1951. Management is looking ahead for further expansion if ore supply warrants it. A tract of land covering more than 200 acres has just been purchased for tailings disposal, and work has been started on a pilot plant for a solvent extraction process.

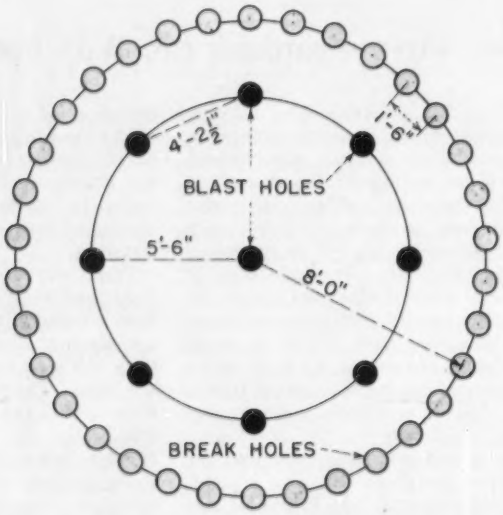
E&MJ is indebted to the men on the Vitro team, both at Vitro Uranium Co. and at Vitro Minerals Co. for the many courtesies extended during our recent visit to the properties.

OPERATING IDEAS



Drive Drawpoints Off Haulage Drift, Use Overcast Loader

DRAWPOINTS COLLARED DIRECTLY OFF HAULAGE DRIFT and overcast loaders are being tried for loading from shrinkage stopes at American Chrome Co., Nye, Montana. According to John Bley, manager, the work is experimental but savings in stope preparation and ore gathering are indicated. Used in narrow veins 5 to 8 ft wide, the method requires a minimum of preparation and brings a stope into production within 2½ months. About 40% of the work is done in ore. Nature of ore keeps it from flooding out of drawpoints and two pieces of 6-in. lagging set in L-shaped bolts hold the ore after loading and keep the track clear. As shown in drawing above, drawpoints are cut in footwall side of haulage drift at 15-ft centers. It takes one 5x5-ft drift round 6 ft deep, followed by two raise rounds 5 ft deep. Raise rounds are driven as steep as necessary to get back on foot wall of vein. And they are fanned out enough to join adjacent drawhole.



Use Quarry Rig to Drill Shaft

ROTARY-AIR QUARRY DRILL was used in sinking 79-ft air shaft through sedimentary rock at Hanna Coal Co.'s Glen Castle mine in Ohio. All drilling was completed before any muck started coming out. Perimeter of 16-ft diameter shaft was drilled full depth with 8½-in. holes on 18-in. centers by Joy Champion rig and left unloaded as shear line. Central volume was broken with nine 8½-in. blastholes drilled full depth at same time as perimeter holes. Blasting was done in 10-ft cuts. A 2 cu yd clamshell bucket was used to muck out. Drilling rate average 350 ft per shift in spite of considerable water. Blasting and mucking averaged 9½ ft toward the end.

Personnel responsible for the scheme included Richard King, James Reilly and J. S. Harmon. Under the latter's supervision the project resulted in an economical and safe job.

Here are some other notes. Holes were filled with limestone chips immediately after drilling; then blastholes were flushed out with air before loading and blasting—sand is recommended for future use since it would probably eliminate the difficulties encountered with packed limestone chips. Each 10-ft section of holes was loaded with 25-lb explosive and all holes detonate simultaneously with Primacord. Practically no scaling of walls was required, the breakholes sheared clean. Although blasting was done at end of shift, under similar wet conditions, Mr. Harmon recommends cleaning, loading and blasting at start of shift so muck will be dry for easier excavation. He also believes an outer ring of holes, not shown, drilled to limestone to give 1-ft ledge for support of steel liner, is unnecessary. Steel pins and concrete will hold it.

In this kit is the answer to all your conveyor belt needs!

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Now, for the first time, you can see in miniature a conveyor belt designed to your exact specifications... built right before your eyes... in only a few minutes of your time, on just a few inches of desk space. And this "U. S." Conveyor Belt Construction Kit can save your company countless hours, thousands of dollars of expense.

Completely new and exclusive with "U. S.", the Kit removes all uncertainty about the right belt for the specific job. Every type of materials handling problem, every kind of operating condition is taken into account. You see exactly how your conveyor belt must be constructed for highest output at lowest cost and long operating life.

Whether or not your present system has been giving you good service, you owe it to yourself to look into this unique and comprehensive analysis of your conveyor belt needs.

Absolutely free—no obligation whatsoever. It is strictly a service of United States Rubber Company. A "U. S." Sales Engineer will contact you in the near future. Or better still, why don't you call any one of the 27 "U. S." District Sales Offices and set up an appointment to see this remarkable new method of analyzing your conveyor belt requirements?

"U. S." Research perfects it..."U. S." Production builds it... U. S. Industry depends on it.

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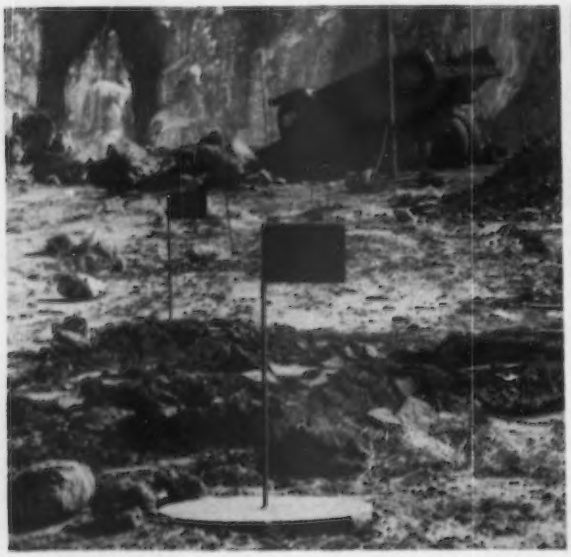
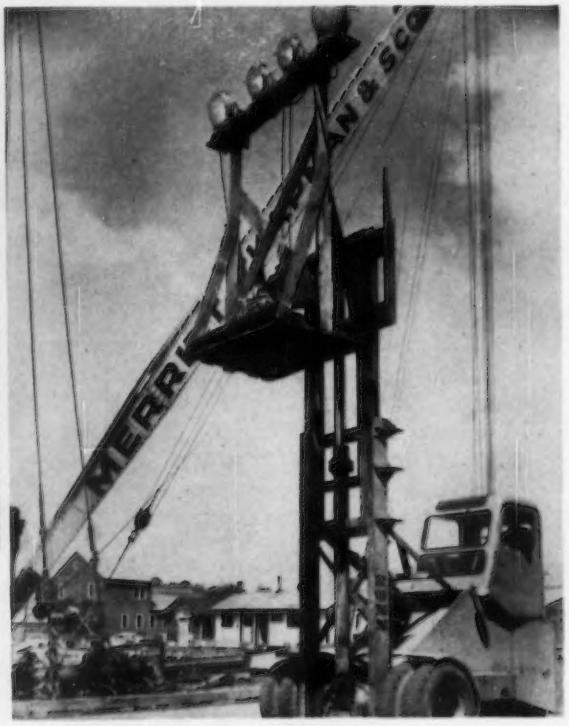
Components Assembled Into Unit Speeds Ore Handling

TRANSFER OF ORE from truck to railroad car at Skyrme Pit of Anaconda Co., Butte, Mont., is made fast by combining several steps into one integrated operation. Ore bin receives ore; pan feeder discharges into jaw crusher. Set at 6 in., the crusher feeds onto 36-in. belt conveyor which in turn dumps into cars. The equipment made by Pioneer is used by F & S Contracting Co. of Butte who have contracted the 3000 tpd mining job. Crusher handles 1000 tph.



Device Aids Pit Operations

FLAGGED DRILL HOLE COVERS can be used to mark location of holes to be drilled as well as to show location of holes already drilled and to eliminate the hazard of open holes. A piece of reflective tape makes flag stand out at night. Device helps operations in another way too, since necessary instructions for drilling or loading can be written on flag with soapstone. Developed by the Morton mine pit crew last fall, the covers are now in use at all Minnesota mines of the M. A. Hanna Co., helping to do away with the long stressed hazard of open holes. They are made with a flat base 1 ft-10 in. diameter of ⅛-in. mild steel plate. The 6x8-in. flag is of same material welded to a 2½-ft long ½ in. diameter mild steel rod. Rod is welded to center of base. The whole cover is painted red



Another Use For Fork Lift

THIS PORTABLE LIGHT TOWER was built by the Connecticut Terminal Company Inc., New London, Conn., for night work in its materials storage yard. Tower is mounted on pallet and transported by Clark-Ross fork truck anywhere in 300,000 sq ft area. Usually set on ground, tower can be supported at high level by truck if broad illumination is desired.

STEEL...one piece or a truckload

Delivered where you want it . . . . when you want it

Sure we like big orders—and we handle them easily, every day, because our stocks are the world's largest, our cutting and handling facilities unsurpassed. But our business depends on small orders as well, and you'll find we never lose sight of this fact. Whether you want one bar or a thousand—one sheet or many tons, you'll get courteous service—quick delivery. Dependable, certified quality, too. Call us and see.

JOSEPH T. RYERSON & SON, INC. **RYERSON STEEL**

Principal products in stock: Bars, structurals, plates, sheets, tubing, alloy steel, stainless, re-bars, etc., also machinery & tools

PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT • BUFFALO
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NEW MAPS

California Aerial Relief Map

Golden State's 158,000 square miles were an ideal relief map subject for Aero Service Corp.'s latest endeavor. New map shows the whole sweep of the state, from the Coast Ranges and the Great Central Valley to the Sierras and desert areas. Map extends 75 miles beyond the border of California into Nevada, including Reno-Lake Tahoe and Las Vegas-Lake Mead area; and south over the border to cover Tijuana-Aqua Caliente.

In eight colors, the map is 41 x 47 in. on a scale of 1:1-million. Made of Vinylite and weighing only 2 lb the map has been plastic coated so that it can be easily marked with grease pencil or crayon. Marks, dust and fingerprints wipe off easily.

Highways, up-to-date to April 1955, are in red; railroads and place names in black; lakes and oceans are blue; grasslands are green-yellow; chaparral is light tan and barren areas are smoky-gray.

Three maps are combined into one with land forms, mountains, valleys, and drainage patterns; land use, in 10 different categories; and over 3,000 geographic names, including 2,000 towns and cities. Isolated communities with population of 22-30 are included.

This map is one of a series produced by Aero Service Corp., Philadelphia 20, Pa. Maps of the United States, Venezuela and New Jersey have been released. Map of Canada came out in July. Europe will be published in September. Map with tan frame priced at $45 fob Philadelphia. Will also be on sale in California stores.

Geologic Map of New Hampshire, by Marland P. Billings, Harvard University. 41 x 54 in. on a 1:250,000 scale. First full scale geologic map on the area since 1877. Can be obtained from Chief of Distributions, Geological Survey, Washington 25, D. C. and from New Hampshire Planning and Development Commission, Concord, N. H. Price $2.

Geologic Map of Elkhorn Rand Area, Billings and Golden Valley Counties, North Dakota, by Bernold M. Hanson for the North Dakota Geological Survey, Grand Forks, North Dakota. 36 x 24 in. map with formations and text material on one sheet. Price not specified.

•The following maps may be obtained at the price specified from Chief of Distributions, Geological Survey, Washington 25, D. C. and from Denver Distribution Section, Geological Survey, Denver Federal Center, Denver, Colo. Over the counter purchases can be made at the Survey offices; in Room 1028 General Services Administration, Washington, D. C.; Appraisers Building, San Francisco, Calif.; Room 529 Post Office Building, Los Angeles, Calif.; Room 468 New Custom House, Denver; and Room 504 Federal Bldg., Salt Lake City.

G. P. Map 125. Airborne Radioactivity Survey of Part of Moffat County, Colorado. Covers area south of 40°45'. Price 50¢.

G. P. Map 126. Airborne Radioactivity Survey of Part of Moffat County, Colorado. Covers area south of 40°45'.

G. P. Map 127. Airborne Radioactivity Survey of Myton Area, Duchesne and Uintah Counties, Utah. Price 50¢.

•The following four maps have been released in open file. Copies are available for inspection and consultation at the Geological Survey, Room 1033 General Services Administration Building, Washington D. C. and at the office of the Director, State Bureau of Mines and Geology, Butte, Montana; the Geological Survey office, 416 Electric Building, Great Falls, Montana; 315 Federal Building, Billings, Montana and Room 468 New Custom House, Denver.

Preliminary Geologic Map of the Lothair Quadrangle, Montana, by J. F. Smith, I. J. Witkind, D. E. Trimble and E. G. Duckworth. One map. No text.

Preliminary Geologic Map of the Lonesome Lake No. 2 Quadrangle, Montana, by J. F. Smith, I. J. Witkind, D. E. Trimble and E. G. Duckworth. One map.

Preliminary Geologic Map of the Goose Mountain No. 1 Quadrangle, Montana, by J. F. Smith and friends. One map.

Preliminary Geologic Map of the Goose Mountain No. 2 Quadrangle, Montana, by J. F. Smith and friends. One map.

•The following maps and bulletins were also released in open file. Copies are available for inspection and consultation at the Geological Survey, Room 1033, General Services Administration, Washington, D. C. and where noted below.

Engineering Geology as Applied to Highway Construction, by Leonard M. Gard, Jr. 40 pp. 2 figs. 63 plates. Also on file at Room 468 New Custom House, Denver.

Geologic Strip Map along Route 28, Tauton and Bridgewater Quadrangles, Mass., by J. H. Hartshorn. One map. 3 pp. text. Also available Geological Survey, Room 1, 270 Dartmouth Street, Boston 16, Mass.

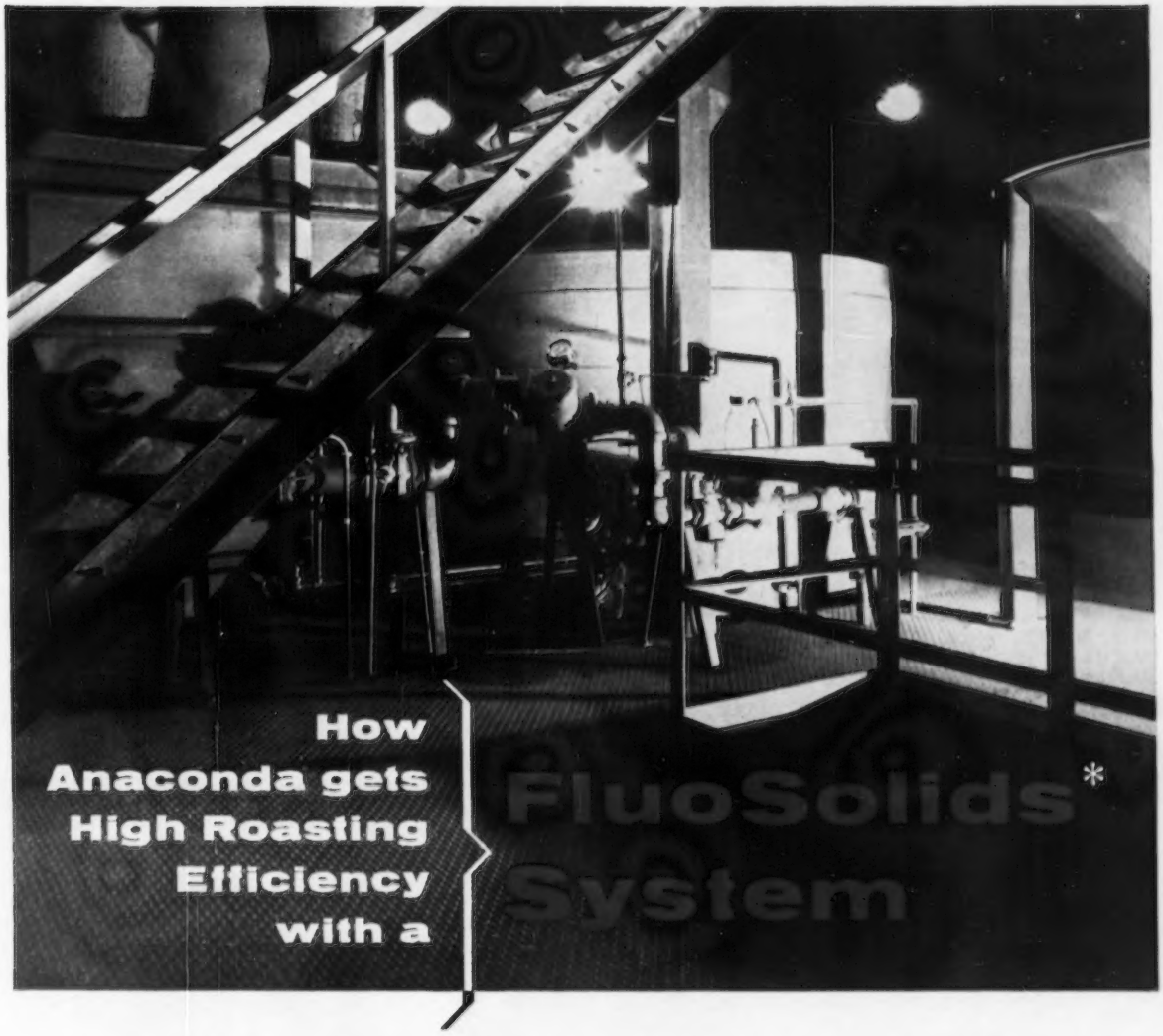
Physical Stratiography of the Phosphoria Formation in Northwestern Wyoming, by R. P. Sheldon. 105 pp. 31 figs. 2 tables.

Pegmatites of the Middletown Area, Connecticut, by Frederick Stugard, Jr. 122 pp. 9 figs. 14 tables. Available in the office of the Director, Connecticut Geological and Natural History Survey, University of Connecticut, Storrs, Conn.; and Geological Survey, Agricultural Research Center, Beltsville, Maryland.

Maps of the Gold Bug Mine Tunnels, the Ruby and Pink Eye Mines, the Ruby OK and Alabama Mines and the Little Ben Mine, Little Rocky Mountain, Montana, by G. F. Loughlin. 5 maps. No text. Available at the office of the Director, Montana School of Mines and Geology, Butte, and Geological Survey, 315 Federal Building, Billings, Mont.

Petrology of Umanak and Bogoslof Islands, Alaska, by F. M. Byers, Jr. 193 pp. 27 figs. one plate and 9 tables. Also on file at the Department of Geology Library, Rosenwald Hall, University of Chicago, Chicago, Ill. and Geological Survey, 4 Homewood Place, Menlo Park, Calif.

Geologic Maps and Sections of the Helen Beryl, Elkhorn and Tin Mountain Pegmatite Mines, South Dakota, by L. R. Page, M. H. Staatz and others. 20 maps. No text. Available Geological Survey, 468 New Custom House, Denver and South Dakota School of Mines Library, Rapid City, S. D.



How Anaconda gets High Roasting Efficiency with a FluoSolids* System

For sponge iron production at Anaconda, Montana, Anaconda Company needed a calcine containing less than 1% sulfur. Their conventional fixed bed pyrite roasters, producing gas for an acid plant, delivered a calcine averaging 2 to 6% sulfur. The problem was solved by installing a Dorrco FluoSolids System for an additional roasting stage.

Unique in this installation is the fact that roasting is carried out autogenously on pyrite containing as little as 2% sulfur. Only outside fuel required is for starting up the System. What's more, with sulfur in the feed all the way from 1 to 9%, calcine from the FluoSolids System consistently contains 0.8 to 0.9% S. The FluoSolids Reactor has an inside diameter of 10′ and handles 200 TPD at 1200°F.

High roasting efficiency is just one of the many advantages of fluidization. If you'd like more information on the Dorrco FluoSolids System, the most significant advance in roasting techniques in the last 30 years, just drop a line to Dorr-Oliver Incorporated, Stamford, Connecticut.

*Trade-Mark Reg. U. S. Pat. Off.

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WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
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PERSONALS

Rocky Mountain Committee

COMMITTEE for second annual Rocky Mountain Minerals Conference to be held October 6-8, Salt Lake City, Utah. First row, left to right: Glen A. Burt, Norman Weiss, Neil Plummer, J. M. Ehrhorn, chairman, Utah Section, AIME, and R. C. Cole. Second row: C. P. Mott, Raymond Thompson, I. K. Hearn, S. I. Bowditch, V. L. Stevens, W. F. Rappold. Third row: I. G. Pickering, R. E. O'Brien, K. A. Lehner and E. K. Olson.

J. D. Elliott, since 1941 shift boss in the mill laboratory, has been named assay office supervisor, Hollinger Consolidated Gold Mines, Ltd., succeeding **W. P. Bennetts,** who has accepted a position with Heath Steele Co.

Frederick R. Jeffrey, vice president of National Zinc Co., Inc., has been elected a director of the company.

Allen F. Agnew, formerly in charge of the Wisconsin and Iowa zinc-lead projects for the USGS, has accepted a position as associate professor of geology at the University of South Dakota.

Harold Thrash, general manager of Tri Counties Rice Drying Co., has been named secretary-treasurer of Central Eureka Corp., Originally a gold mining firm, it is now taking steps to enter the uranium field.

Neal M. Muir, formerly examination engineer with the U. S. Bureau of Mines in Spokane, Wash., has opened a mining engineering office in Grand Junction, Colo.

Glenn Waterman, resident geologist at Chuquicamata, Chile, for Anaconda Co., has been named a geologist at the Salt Lake City, Utah office, exploration division, of the firm.

Huber C. Swett, assistant general superintendent, Bethlehem Pacific Coast Steel Corp.'s Los Angeles steel plant since 1949, has been appointed chief metallurgical engineer for the company.

K. M. Dewar has been appointed manager of the mining division of R. M. Way & Co., Ltd., consulting engineers of Toronto, Canada.

E. C. Peterson, mining engineer with Pickands, Mather & Co., has been transferred from assistant engineer, Mahoning mine, to assistant engineer at Carmi mine.

FRANK C. PICKARD, chief engineer of the mining division of the Gregg Car Co., Ltd., is taking an extended business trip through Central and South America. Mrs. Pickard is accompanying him.

Dr. Joseph W. Berg Jr., formerly assistant professor of geophysics, University of Tulsa, Tulsa, Okla., has accepted the position of assistant professor in the department of geophysics, University of Utah, Salt Lake City, Utah. **Dr. Kenneth L. Cook** has been promoted to full professor and head of the department.

Edward Wisser and **Manning W. Cox,** mining geologists, have announced their association as the firm of Wisser and Cox, consulting geologists, with offices at 55 New Montgomery Street, San Francisco, Calif.

Walter M. Fenton, sales manager for Lithium Corporation of America, Inc., has been named director of the newly formed department of product research and development.

Don R. Smith, formerly associated with American Smelting & Refining Co., is now with the Trentwood, Washington, rolling mill of Kaiser Aluminum and Chemical Corp.

Jacob Blecheisen, president of Rosiclare Lead and Fluorspar Mining Co., has been named by the Secretary of the Interior to the Fluorospar Industry Advisory Committee, Office of Minerals Mobilization.

Steep Rock Iron Mines, Ltd., has promoted the following: **Wyatt Hegler,** from senior mine captain to superintendent at Errington No. 1 mine; **J. H. Chesney,** from junior mine captain to mine captain; **Gerry Hamilton,** from senior surveyor to mine engineer at Errington No. 1 mine, and **Hector Jeansonne** from shop foreman to master mechanic at that mine.

Edward W. R. Butcher, chief mining engineer for the northern ore mines of Republic Steel Corp., has retired after 37 years of service with the company.

Harry J. Wolf, mining and consulting engineer, has been in Arizona and California during the past few months, investigating uranium, tungsten and sulphur.

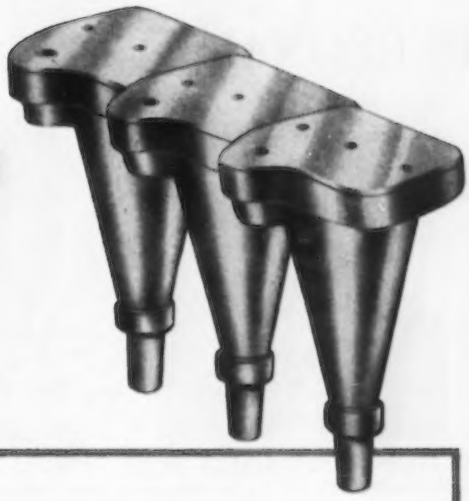
SIM S. CLARKE, general superintendent, Tri-State Mines, Eagle-Picher Co., has retired to enter private consulting practice on Mine Mechanization in Baxter Springs, Kansas.

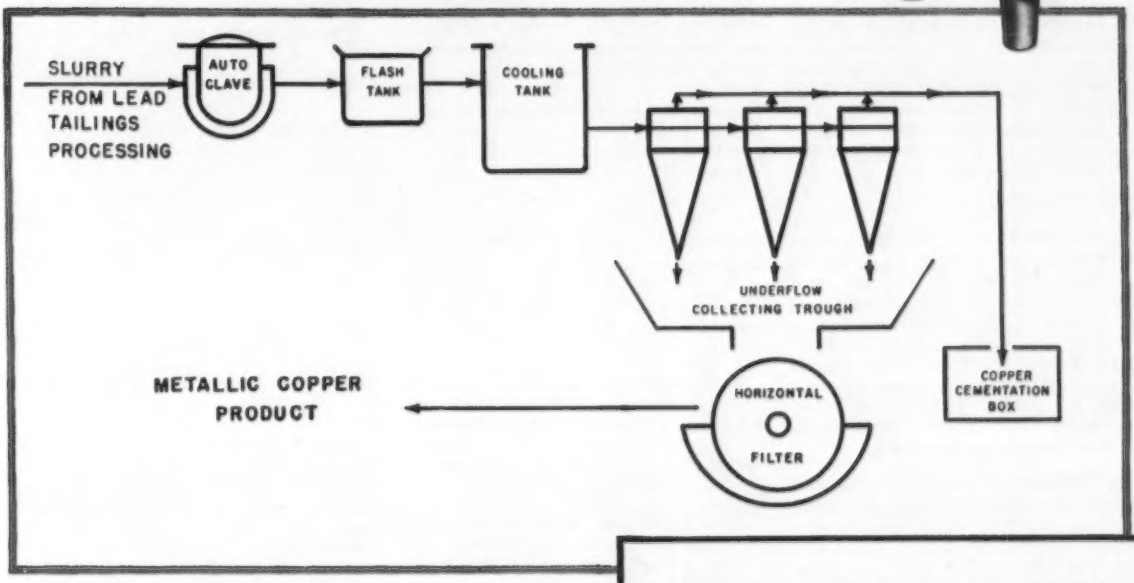
John F. Myers has joined the Denver Equipment Co. as consultant. He was formerly superintendent of concentration for Tennessee Copper Co. A specialist in flotation, he holds the AIME Richards award for work in beneficiation of minerals.

E. J. Colthorp, assistant operating superintendent since 1948, has been named district superintendent of mines, North Central District, for Consolidated Mining and Smelting Co., succeeding **J. E. McMynn,** who has been given special duties in administrative controls at Trail, B. C.

These Heyl & Patterson 3" Cyclones

improve the Recovery of Copper from Lead Tailings





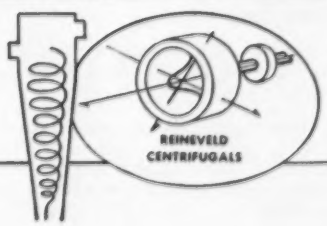
The engineers of a large Lead Company wanted to improve the system they had been using to remove metallic copper from tailings. They wrote to Heyl & Patterson, giving an outline of their problem.

A H&P Engineer visited the plant to see the original recovery system. After watching it in operation, he made a rough sketch of a New System utilizing H&P 3" Cyclones. Engineers in the H&P Special Apparatus Division approved the proposed system and suggested that a test be made under actual operating conditions. The results showed that H&P 3" Cyclones would recover 98-99% of the freshly precipitated Metallic Copper . . . a substantial gain over the original method . . . as well as rejecting an undesirable calcium salt.

HOW THE NEW SYSTEM WORKS:

The Tailings are first processed at a high temperature. After processing, the slurry is reduced to about 170° F., and is fed from a cooling tank to H & P 3" Cyclones. The cyclone underflow contains 98-99% finely divided metallic copper at 15-20% solids by weight. The overflow is carried to a cementation box where the soluble copper is removed. The metallic copper, a spongy, cake-like mass, discharges directly into a horizontal filter. When removed from the filter, the copper metal product has a moisture of 12-15%, and is ready for marketing.

Heyl & Patterson
INC.



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PHONE COurt 1-0750

PERSONALS *(Continued)*

WILLIAM B. PORTERFIELD JR. has joined National Potash Co. as vice president and sales manager. He resigned as assistant sales manager of United States Potash Co. to become associated with the newly formed company which is jointly owned by Freeport Sulphur Co. and Pittsburgh Consolidation Coal Co.

JOHN W. PATTEN, (above) for the past year and a half Chicago district manager of the Classified Division, McGraw-Hill Publishing Co., has been named New England district manager for *Engineering & Mining Journal* and *Coal Age*, succeeding **John B. Lewis**, who has been named Philadelphia district manager.

Uranium Reduction Co.'s personnel on the $8-million mill at Moab, Utah, named, include: **J. W. Burgess,** formerly with American Lead & Smelting, general manager of construction; **Sid Worthen,** project engineer; **Roy Hollis,** general manager; **E. H. Snyder Jr.,** assistant to general manager; **Dan Stewart,** chief geologist for the Big Indian venture; **J. W. Losse,** controller, **Clem Chase,** metallurgist, and **Ben Coomes,** project auditor

Roy MacLean, manufacturing process engineer for American Potash & Chemical Corp., has been named general foreman in charge of production at the new American Lithium Chemicals, Inc., plant at San Antonio, Texas. **Dwight Sawyer,** senior research engineer, succeeds Mr. MacLean.

Lucien Hugh Cullen has been elected president of the newly-formed Cullen Minerals Corp., planning immediate entry into uranium, oil and gas ventures. Until recently, Cullen was president of Atomic Power Uranium Corp., and will remain as a director.

W. J. Fenton, former mill superintendent at Renabie, has resigned to accept a position as assistant mill superintendent of the metallurgical and chemical pilot plants of Beaucage Mines, Ltd., North Bay, Ontario.

J. K. Mueller has been transferred from El Paso Natural Gas Co. to Rare Metals Corp. where he is field project engineer on construction of a uranium mill at Tuba City, Ariz.

Charles H. Calkins is now chief plant engineer at Pacific States Steel Corp., Niles, Calif.

Franklin Coolbaugh, president of Climax Uranium Co., has been named to the board of directors of Climax Molybdenum Co. He joined Climax Molybdenum in 1933.

Arthur B. Haswell, vice president-engineering of the Tennessee Coal & Iron Div. of U. S. Steel Corp., has resigned after 43 years of service. **Norman C. Michels,** assistant vice president, succeeds Mr. Haswell.

K. L. McRorie has been named general superintendent, Hogarth mine of Steep Rock Iron Mines, Ltd. **S. G. Hancock** has been named assistant to the manager and **Walter Bannister** has been named general mining engineer.

Fred Dyson has been named acting superintendent of the M. A. Hanna Co. Cooley group mines and **LeRoy Clover** as assistant superintendent. **Art Nelson** has been appointed superintendent of Hanna's new Parcel No. 3 mine at Coleraine, and **Bob Jensen** is mechanical supervisor.

Bruce Valine, mining engineer, is now with the San Manuel Copper Co., at San Manuel, Arizona.

G. W. Moad, formerly chief accountant of the Northport unit of American Smelting & Refining Co., has been transferred to chief accountant for Lake Asbestos of Quebec, a wholly owned subsidiary of A. S. & R.

James D. Molyran, former mill engineer for U. S. Gypsum at Fort Dodge, Iowa, has been called to active duty with the Corps of Engineers as second lieutenant, stationed in Washington, D. C.

H. W. Norman, AEC geologist for the Spokane area, has resigned to become geologist for Daybreak Uranium and for Morning Sun Uranium, Inc. Norman is succeeded by **Donald Hetland,** a University of Washington graduate geologist.

A. Maxwell Hage is the new editor of Uranium Information Digest, published by the Uranium Ore producers' Association, Grand Junction, Colo.

W. B. Schipper is now geological and mining engineer for Consolidated Coppermines Corp. in Kimberly, Nevada.

OBITUARIES

Morris Felton LaCroix, 67, president of the Copper Range Co., senior partner of Paine, Webber, Jackson & Curtis, and board chairman of General Telephone Corp., died July 28 at his home in Brookline, Mass. He was instrumental in the development of a processing plant for low grade ore in the Upper Michigan Peninsula, and the establishment of an entire new city there.

Marcel Dupont, vice president of Indussa Corp., and consulting engineer for Union Miniere du Haut-Katanga, died suddenly, July 24.

John Sekulic, 63, president and general manager, Lucky Friday Silver-Lead Mines Co. since its incorporation in 1939, died June 11 following an extended illness.

Frank L. Kennicott, 58, mine and mill superintendent for Summit King Mining Co. for the past 20 years, died June 29 in Fallon, Nevada.

Henry Y. Walker, 75, retired president, American Smelting & Refining Co., died July 2 after a brief illness. He joined the company when it was formed in 1901, and retired as its president six years ago.

Lewis P. Larsen, 79, president of Pend Oreille Mines & Metals Corp. and Reeves McDonald Mines, died July 14 in Spokane, Wash., following a prolonged illness. He began his mining career in 1897.

James Neston Redman, 64, colorful Colorado mining man with interests in the Alma area, died Aug. 2 in St. Louis, Mo., following an operation. He was a friend of the late H. A. W. Tabor and Baby Doe Tabor.

RICHARD S. REYNOLDS SR., 73, chairman of the board of Reynolds Metal Co., died July 29 at his home in Richmond, Va. He was chairman of Reynolds Mining Corp., Reynolds Reduction Co., and the Reynolds Research Corp., and was president and director of Reynolds Alloys Co.

for lower cost control of moderately **Corrosive** fluids

Fig. 2651-A Gate

JENKINS

NICKEL IRON

Valves with Type 316

STAINLESS STEEL

Trim

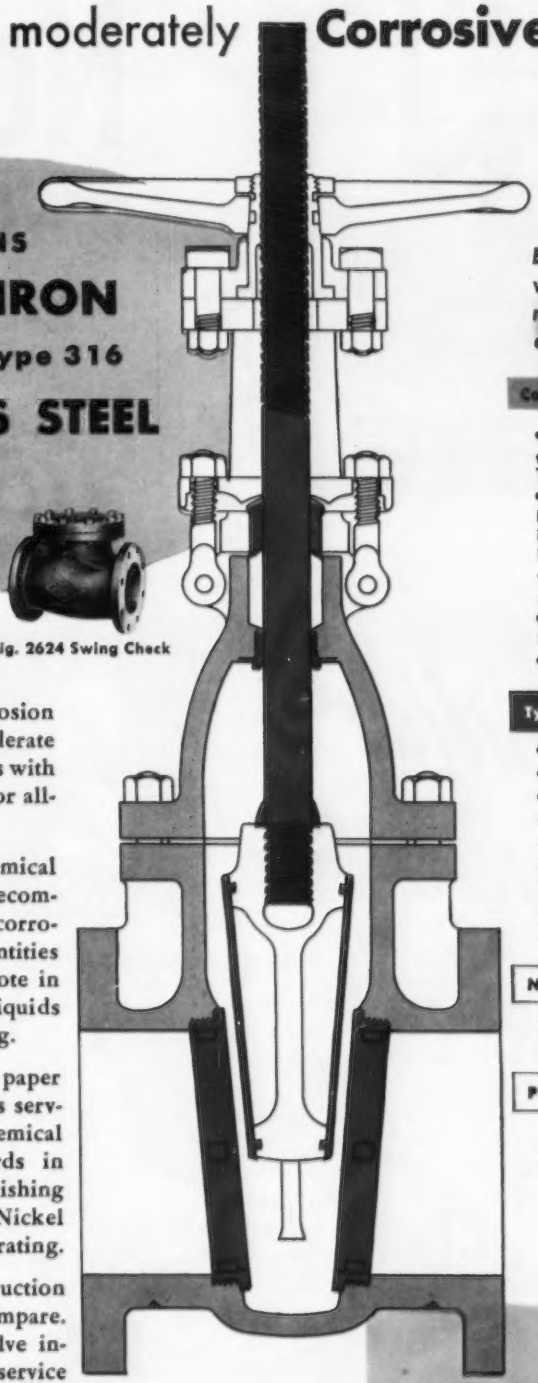


Fig. 2624 Swing Check

Every part in contact with fluid is the right metal to block corrosion and beat wear.

Cast NICKEL IRON

- **BODIES** Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- **BONNET** Rugged construction, like body. Swing-type gland bolts. Screwed-in back-seating bushing. Deep stuffing box.
- **YOKE** Integral with bonnet in 2″ to 4″ sizes.
- **WEDGE** In 10″ to 24″ sizes, with Stainless Steel Wedge Rings.
- **COVER** In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- GLAND
- BONNET BUSHING
- SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10″ to 24″ sizes.
- SEAT RINGS
- DISC and HANGER in Check Valve

NI-RESIST Type No. 2

- WEDGE of I-beam structure is solid NI-RESIST in 2″ to 8″ sizes.

PRESSURE RATINGS

2″ to 12″—200 lbs. O.W.G.
14″ to 24″—150 lbs. O.W.G.

This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for all-stainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

Jenkins *extra value* construction throughout. Get details — compare. See why they stretch your valve investment dollar — with longer service life, lower maintenance cost.

ALSO RECOMMENDED for fluids used in electroplating, photograph finishing, textile bleaching, dyeing and finishing and heat treating of metals.

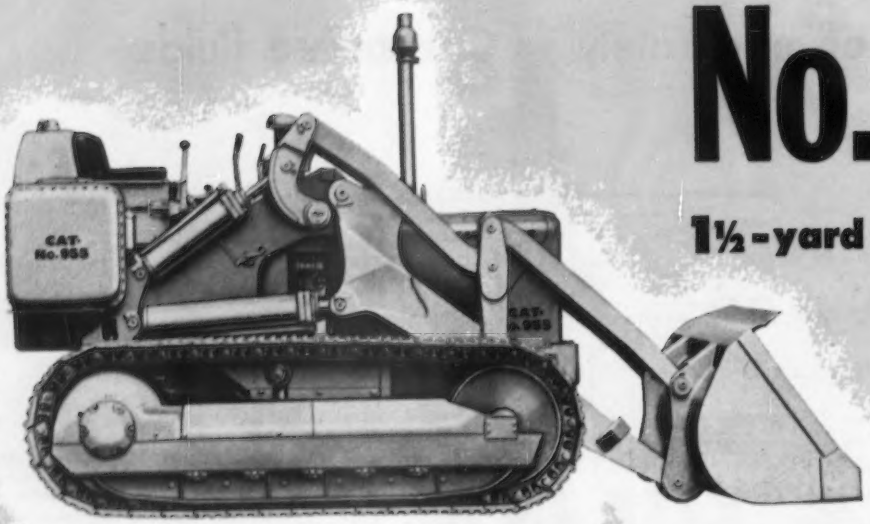
GET COMPLETE SPECIFICATIONS from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17. Ask for Bulletin 118.

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864 TRADE JENKINS

Jenkins Bros

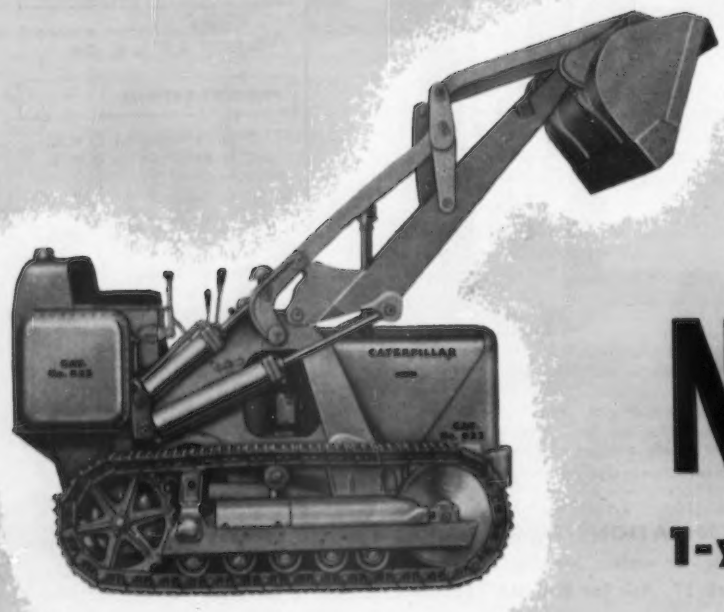


No. 955

1½-yard capacity

Caterpillar announces

2 NEW



No. 933

1-yard capacity

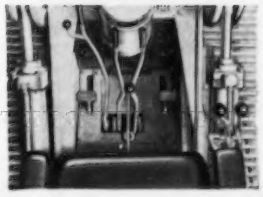
WASHINGTON IMPACT

"BIG-PRODUCTION" FEATURES OF THE NEW NO. 955 AND NO. 933

40-DEGREE BUCKET TIP-BACK AT GROUND LEVEL. Large tip-back at low bucket height results in larger loads every pass—bigger production per day!

NEW OIL-TYPE CLUTCH. Stands up under continuous, repeated use. Cuts maintenance costs and time two ways: (1) Clutch adjustment, while easy, is seldom required. (2) Plate replacement is often unnecessary even at engine overhaul.

Also helps step up production with easier shifting for operator.



CONVENIENTLY LOCATED LIFT AND DUMP LEVERS. All controls are within easy reach—bucket controls are a one-hand operation!

"DESIGNED-IN" COMFORT. Operator sits high in a comfortable seat, with excellent visibility of all bucket conditions.

PERFECT BALANCE. Weight distribution, engine horsepower and bucket capacity are balanced so that the full length of the track stays on the ground with a heaped load in the bucket.

NEW 3-GROUSER TRACK SHOES. Tested and proved on tough jobs, they deliver better traction—longer life.

OPTIONAL STARTING. Your choice of 6-volt electric starting for starting engine or 24-volt direct electric starting—from the seat, either way.

VERSATILE ATTACHMENTS. Your job range is increased by a variety of buckets and other useful attachments.

BRIEF SPECIFICATIONS	No. 955	No. 933
Flywheel HP at sea level	70	50
Bucket capacity, cu. yd.	1½	1
Bucket tip-back at ground level, degrees	40	40
Bucket tip-back at max. lift, degrees	47½	48
Dumping height (center of hinge pin to ground)	128"	118½"
Weight (approx.) lb.	21,480	15,500

TRAXCAVATORS

MODERN HYDRAULIC SYSTEM. Full-flow hydraulic system filter protects moving parts against abrasive particles in fluid. Filter handily located for easy replacement of element.

Hydraulically balanced vane-type pump insures delivery of full volume and pressure of oil for thousands of hours. Operating valves in tank provide maximum protection against damage and dirt. Closed hydraulic system—no vents or breathers—prevents entrance of dirt.

HIGH REACH. Plus strong box section arms for rugged service. Box-type cross brace prevents twisting or bending.

PLENTY OF POWER. Power is ample to "bury" the bucket and provide fast lifting action and positive dumping under all load conditions.

BALANCED UNITS for BIGGER PROFIT!

Designed from the ground up as excavating and loading machines, these two new CAT*-built Traxcavators* are balanced for bigger production at lower cost. Built and backed by *one* manufacturer, they give you all the advantages of single manufacturing responsibility. With practical, advance-design features, they're engineered to *outproduce* ordinary tractor-shovels of the same capacity. You'll find these units the handiest tools in your line-up. Get the money-making picture from your Caterpillar Dealer—ask for a demonstration!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

NEW BIG-PRODUCTION TRAXCAVATORS

ANOTHER EXAMPLE OF CATERPILLAR LEADERSHIP IN ACTION

WASHINGTON IMPACT

Surprise Veto of H.R. 6373 Halts Mineral Purchase Extensions

PRESIDENTIAL VETO of H. R. 6373, the recently-passed bill to extend and double Government purchase amounts of seven domestic minerals, has caused considerable comment in Washington. It clarifies the thinking of the Administration on mining legislation. Bill, introduced in May 1955 by Rep. Clair Engle (D-Cal.), and passed by Congress during the last week of its first session, would have acted as an amendment to the Domestic Minerals Program Extension Act of 1953. The act provided special legislation to buy asbestos, beryl, chrome, columbium-tantalum, manganese, mica and tungsten from domestic—and foreign in the case of columbium-tantalum—producers.

Passage Was Expected

Most Government observers and officials had presumed the bill would be signed by President Eisenhower, as being in line with the President's Cabinet Committee on Minerals Policy report last November. The report recommended a comprehensive domestic minerals program. Interior Department had returned a generally favorable report on the bill, and the Budget Bureau had said it was not opposed to such legislation. The House passed the bill unanimously, and the Senate also passed it in a one-sided vote.

The first purchase program under the provisions of the Defense Production Act of 1950 was set up in May 1951. Since that time, seven minerals have been placed under the program, and two more were being pushed in the last session of Congress. Antimony had been added to H. R. 6373 as a Senate amendment, but was removed in a House-Senate compromise. Tin has been urged in H. R. 7145, introduced by Delegate E. L. Bartlett (D-Alaska), and S. 2648, introduced by Sen. W. Kerr Scott (D-N. C.), which would require purchases of 10,000 long ton units at a base price of $1.25 per lb.

Effect of the veto will not be felt so soon on asbestos, beryl, chrome, mica or tungsten as it will on columbium-tantalum and manganese. The first five minerals are only partially purchased toward already-established quotas, and those programs will continue. However, columbium-tantalum has been over-committed by foreign imports, and the manganese program has been completed at one depot, Wenden, Ariz., which has therefore been closed down. H. R. 6373 would have opened two new depots for increased purchases within 90 days, had it passed.

Figures released by General Services Administration for purchases under the program through June 30, 1955, indicate 963 short tons of crude asbestos, No. 1 and 2 grades have been bought toward a goal of 1,500 short tons; 708 short tons of beryl have been purchased toward a goal of 1,500 short tons; 87,833 long tons of chrome have been purchased toward a quota of 200,000 long tons; 11,842,162 lb of columbium-tantalum pentoxide had been delivered toward a total of 15-million pounds, with foreign imports ordered exceeding the quota; 1,728,001 long ton units (22.4 lb each) of manganese delivered at Butte-Philipsburg, Mont., 3,250,-174 long ton units delivered at Deming, N. M., 6,108,316 long ton units delivered at Wenden and 3,642,084 long ton units delivered to the carload program.

Quotas are 6-million long ton units per depot and 19-million long ton units in the carload program. Mica deliveries have been 6,285 tons toward a quota of 25,000 short tons; and tungsten deliveries have been 1,930,028 short ton units (20 lb each) toward a quota of 3-million short ton units.

Senator Murray (D-Mont.), a vociferous advocate of greater Government aid to mines and miners, called the "very outside limit cost of $150-million spread over a period of three years" a cheap price compared to billions spent annually to bolster the economies of foreign countries. He implied that Dr. Arthur S. Flemming, director of the Office of Defense Mobilization, had favored the bill. Flemming emphatically denies this.

W. Lunsford Long, president of the Tungsten Institute, and vice-president and general counsel of the Tungsten Mining Corp. indicated further that he felt there had been a shift in Administration policy on the bill. He felt the Budget Bureau, being a spokesman for the President, should have indicated the views that produced the veto in August.

Flemming Is Opposed

Dr. Flemming has stated that he is opposed to programs like the one extended by H. R. 6373. He stated in testimony before the Joint Committee on Defense Production in April 1955 that these programs tie up funds which otherwise could be spent for stockpile needs. He cited tungsten as an example of a mineral which already has been purchased to an excess of 40% of its need to the Government. Flemming has taken the attitude that such purchase programs should be related directly to military needs.

President Eisenhower, in vetoing the bill, said he felt there were several serious disadvantages of the bill: minerals purchases after defense needs were met, purchases considerably in excess of the market price, and an overly advantageous Government aid program to "only a segment of the industry."

The President said he would prefer to see a long-range minerals program, as outlined by the Office of Minerals Mobilization, rather than "Government assistance to the producers of several minerals (which) will be continued under the guise of defense needs when such needs do not exist."

The second session of the 84th Congress may produce some fireworks on this program, since heavy support has already been indicated in Congress. The tin bill is yet to be acted upon, and an attempt to pass a general extension bill may be tried again.

Subcommittee Cites Lack of Coordination in Titanium Program, Sees Possible Shortages

A DIFFERENT LINE of reasoning has been sounded by the Senate Interior and Insular Affairs Subcommittee report on titanium. Blasting all previous information on the light metal as being out-of-date and unrealistically arrived at, the report, ordered by subcommittee chairman Sen. James E. Murray implies that supplies of titanium, previously considered excessive, may soon be inadequate.

During a two-month period in the spring of 1955, 25 conferences were held on the state of the art in titanium production and utilization. Representatives from Mallory-Sharon Titanium Corp., Rem-Cru Titanium, Inc., Aircraft Industries Association, Metal Hydrides, Inc., Western Pyromet Corp., and Chicago Development Corp. were heard on the fabricating problems. Aircraft companies contacted included Convair, Curtiss-Wright, Grumman, North American, Pratt Whitney, Republic, General Motors, and General Electric. Air Force, Army, Navy, ODM, GSA, and Defense Department representatives were also heard.

Since testimony received was not stenographically recorded, only information available on the talks is available in the interim staff report, issued by the Subcommittee. An implication in the report points to hearings on the titanium industry at a later, undecided date, at which many of the witnesses may be recalled.

The gist of the report is that insufficient Government aid is going to research on titanium, since this is the side of the program that is acting as a bottleneck. Even so, the report says that any information published prior to January 1955 is now obsolete, so rapid has been the advancement of titanium research. The other side of the program that bodes trouble in the future is the actual sponge production program. The report points

out that, although 22,500 tons of titanium have been contracted for, this amount will not be fully achieved until 1958—three years hence.

"Unnecessary Pessimism"

The Subcommittee states that this does not sit well with representatives from titanium fabricators, who feel that within five years titanium will compete "in every respect" with high-strength steels. These representatives also estimate consumption in three years at 10,000 to 20,000 tons of mill products annually.

Subcommittee evidence indicated that "the unnecessarily pessimistic attitude taken by certain Government officials" is not grounded. Research has come a long way, indicated by evidences in the drop of titanium part rejection rates.

The report said one cause of the slow research progress—which it says is still rapid in comparison to early aluminum, magnesium and alloy steel research—has been due to a lack of coordination of research methods. Gen. Kern D. Metzger, who died before the study was completed, blamed some of the difficulties on industry for failing to coordinate its activities and development in titanium research. Basically, however, the report urges the Defense Department to lead the way in research, since it will be the prime user in military emergencies. The report blamed "vacillation and an apparent spirit of 'let George do it' within the Air Force itself, as administered by Secretary for Air Harold E. Talbott" as a contributory factor in a lack of coordination. Battelle Memorial Institute in Columbus, Ohio, was commended for its good work—however the Subcommittee feels that there should be a better way for communicating shop know-how.

In conclusion, the report urged the Office of Defense Mobilization to take a new look at the titanium sponge program. Probable lifting of the curtailments on the program was implied by the Subcommittee, which also suggested sale of Government stockpiled titanium of earlier years, when quality was low, making it useless to current needs. The Subcommittee also recommended cost studies.

This report is one of the first documents pointing up improved research techniques in solving extrusion and tooling problems found so far in working titanium. It also indicates that some aircraft companies are finding the metal is becoming less inconsistent at high temperatures. Meanwhile, the contract for 7,500 tons of titanium between GSA and DuPont has not been signed, and no approval has been given the combined Columbia-Southern Chemical Corp. of Pittsburgh and the Imperial Chemical Industries, Ltd., of England, which would involve 5,000 tons of titanium to be sold to GSA over a five-year period. I. C. I., Ltd., using a variation of the Kroll process, would produce granular titanium by a sodium reduction method. Annual consumption still runs about 2,000 tons.

Labor This Month

MINE-MILL DYNASTY SHAKEN: The long-anticipated action by the Government to depose the leaders of the International Union of Mine Mill and Smelter Workers is just the start of a long campaign. It will take several years of legal tests before the U. S. Attorney General can secure a final verdict on his charges: That the union is dominated by Communists in control of a foreign power.

But, just by initiating its case against Mine-Mill leadership, the Justice Department may have cracked the foundations. Its hope is that Mine-Mill members will add the blows to crumble the platform of their chiefs—and cut short the lengthy court tests.

The clues to department strategy were evident in its petition to the Subversive Activities Control Board to label Mine-Mill as a Communist-infiltrated union. It gives a clean bill of health to the membership with the statement that "most of the members" are not aware that their union is "dominated and controlled by a clique of persons . . . who are members of Communist organizations . . . and who have been engaged in giving aid and support to such organizations, to Communist foreign governments, and to the world Communist movement."

The petition makes a point of one section of the Communist Control Act of 1954—the law used by Justice to move against Mine-Mill—which provides that only 20% of union members in a bargaining unit can secure a National Labor Relations Board election to disaffiliate from the parent union. This may be the first effect of the Government's action. If Mine-Mill members are convinced that the Government's move is sound, they may act to break away from the mine union leadership to join AFL or CIO labor units.

THE CASE AGAINST MINE-MILL: Justice Department investigators report a Mine-Mill membership of some 80-thousand, including a large Canadian division. There are some 175 union locals throughout the United States, with the controlling local in Butte, Montana. The union holds bargaining rights in mining and processing non-ferrous metals—copper, lead, zinc, manganese, uranium and so on—all vital to the national defense. With this background, Attorney General Brownell makes these specific charges:

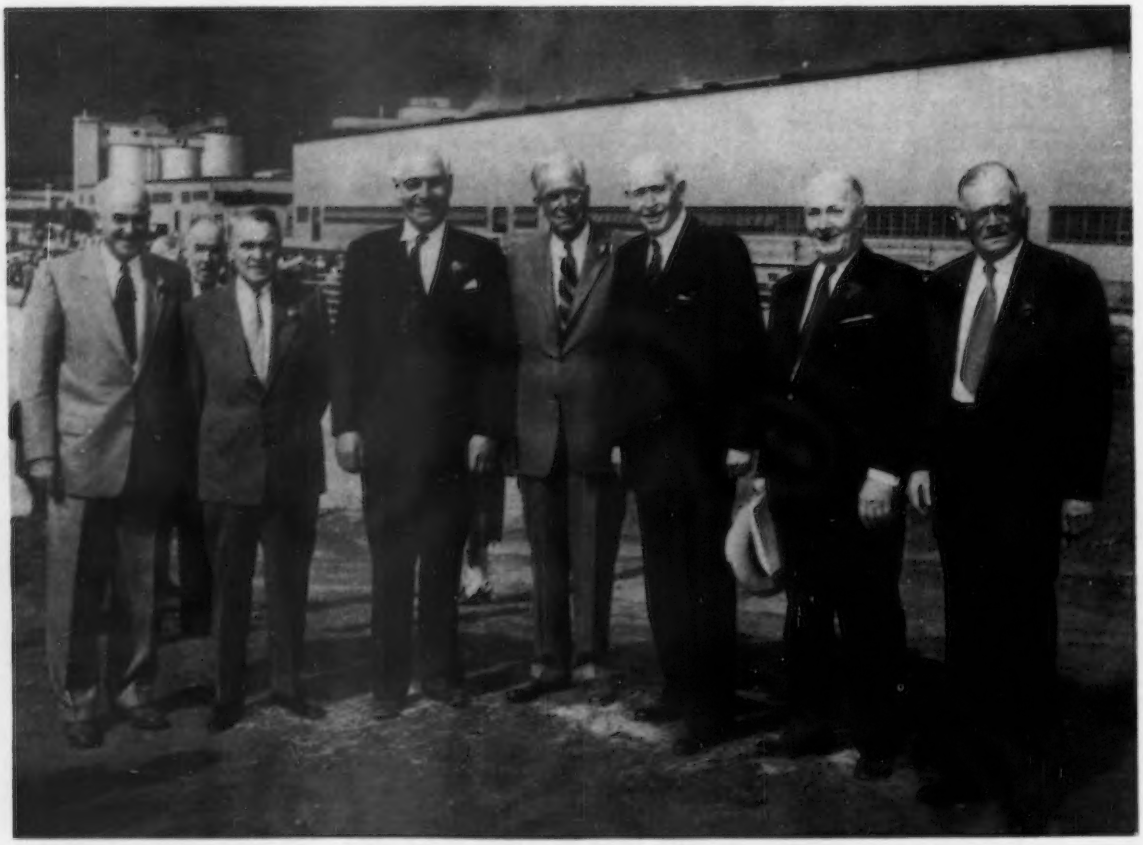
- The executive and office staff of Mine-Mill is "packed" with Communists who control union policies and its publication, "Mine-Mill Union," including the material published in the paper.

- This leadership follows the Communist line, "without deviation," but at the same time conceals from the members their Red ties. To meet requirements of the Taft-Hartley Act non-Communist oath they "purportedly resigned while secretly maintaining membership and affiliation" with the party. Secret meetings and caucuses are held by the leaders "for the purpose of dominating and controlling the union and its personnel, resources, rank and file."

- Officers in the union conspired with non-union Communist officials, including Gil Green, former Communist party chairman of Illinois and John Williamson, former labor secretary of the party. They selected members of the Communist party to run important union committees and in that way maintained control of Mine-Mill conventions and offices.

THE GOVERNMENT'S GOAL—DISSOLUTION: In seeking to tag Mine-Mill as Communist-infiltrated, the aim of the Justice Department is to remove its leaders from control over labor in the non-ferrous industry. But, while the petition singles out the officials, the law provides penalties against the union itself. If the action runs its course, Mine-Mill will be barred as representative of the employees—it will have no legal right to negotiate with management.

There may be some immediate effects of the federal action, even before the case gets under way at the subversive board. Mine-Mill is being challenged by the rival CIO Steelworkers Union at one of its long-time strongholds; the Ray, Arizona division of the Kennecott Copper Co.



EXECUTIVES present at dedicatory ceremonies included, left to right: Chester H. Steele, vice president in charge of western operations for Anaconda; Clyde E. Weed, vice president in charge of operations; Gov. J. Hugo Aronson; Roy H. Glover, chairman of the board; Cornelius F. Kelley, chairman, executive committee; Russell B. Caples, president of Anaconda Aluminum Co.; Robert E. Dwyer, president of the Anaconda Co., formerly the Anaconda Copper Mining Company.

Anaconda's Aluminum Goes On Stream

NEWEST AND MOST MODERN aluminum plant in the world was dedicated Aug. 15 at Great Falls, Mont., when Anaconda Aluminum Co. formally opened its $65-million plant.

More than 7,000 visitors and employees attended the ceremonies at the plant site, located at the foot of Teakettle Mountain, only 40 miles south of the Canadian border. Plant, first constructed since 1946, is operated by the subsidiary of the Anaconda Co., with a 5% interest held by Harvey Machine Co. of California, which also has an option to purchase part of the production. Harvey agreement goes back to 1952.

Principal speakers at the ceremony which noted Anaconda's entry into a new field included Cornelius F. Kelley, chairman of the executive committee; Roy H. Glover, chairman of the board; Robert E. Dwyer, president of the parent company; Gov. J. Hugo Aronson of Montana and Russell B. Caples, president of Anaconda Aluminum, who also acted as master of ceremonies.

Plant is expected to reach its rated annual capacity of 120-million lb by the early part of 1956 and will employ about 450 people at full production. Plant was designed and built to provide for expansion of installations and capacity when required. H. G. Satterthwaite is manager of the new Western giant.

Adapting Pechiney

An adaptation of the plant design of France's largest producer—the Pechiney Co.—was used to build the new facility. Technology adopted is expected to produce aluminum "at the lowest rate of kilowatt-hour consumption."

Notable for its attention to efficiency and safety, the new producer contains air contamination controls called "the best" known in the entire industry. No industrial process water will discharge into the Flathead River, which runs alongside the plant.

Mr. Caples pointed out that the Columbia Falls site was selected because of the proximity of Hungry Horse Dam, fourth largest concrete dam, located on the south fork of the Flathead, seven miles southeast of Anaconda Aluminum. Hungry Horse is a part of the Bonneville power system, is 564 ft high and harbors a 34-mile long lake. Power was first produced here Oct. 1, 1952.

Raw material for the plant—120,000 tons of alumina per year—will be shipped by rail from Corpus Christi, Tex., and Hurricane Creek, Ark., plants of Reynolds Aluminum Co.

Bauxite used in producing the alumina is mined in Jamaica, B.W.I., by Reynolds. (See *E&MJ*, September 1952.)

Four 1,180-ft long pot buildings

CABLE AND MINE EXPERIENCE enable Anaconda to design and build shovel cable that resists razor-sharp rocks, water, sun, heat, cold, and — most important — run-overs.

This cable was "built" in our mines to perform better in yours

If you were a cable manufacturer as well as a miner, you could use your mine experience to build cable better than others.

But since you aren't, it will pay you to buy your cable from Anaconda—who *is* both cable manufacturer *and miner.*

FOR SHOVEL CABLE

Years of mine experience . . . of cable testing and improving . . . have taught us how to make a cable that *stays on the job longer under all conditions.* It's Securityflex* Type SH-D cable.

New, job-tested, high-grade butyl insulation assures better resistance to heat, water and compression. And new neoprene jacket makes this cable even tougher and more abrasion-resistant.

For Type SH-D, *or other shovel cable,* let Anaconda mine and cable experience pay off for you. See your Anaconda Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 55821

*Trade Mark

ANACONDA®
MINE CABLE

FLAT-TWIN CABLE

Improved stranding, new insulation, new grounding wire, and neoprene jacket make this a superior cable for shuttle cars, continuous miners, loaders, drill trucks, cutters.

POWER CABLES

AnacondA Types W & G are rugged, sturdy and long-lived. Used for mine power, shovels, continuous miners, loaders, drill trucks, cutters.

SHOVEL AND DRILL CABLES

Securityflex* Types W and G are used with small shovels, self-propelled drill trucks, pumps and a-c mining equipment. For higher voltages, Type SH cables (shielded) are recommended.

SECURITYFLEX CORDS

Unexcelled for strength, wear resistance and long life. Type SO (heavy-duty) provides superior service on remote control and hand drills.

TROLLEY WIRE

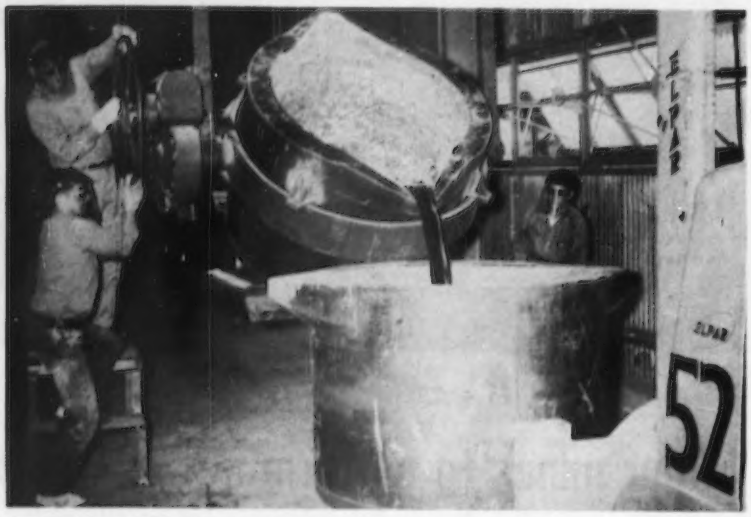
FEEDER CABLE BARE OR INSULATED

TELEPHONE WIRE

SHOT-FIRE CORD

WELDING CABLE

TWO POTLINES, each of 120 pots, are contained in four long buildings. Power is supplied from Hungry Horse Dam, seven miles away. Plant will employ 450.



FIRST ALUMINUM is poured during opening day ceremonies. Each of the 120 pots will produce some 1400 to 1500 lb per 24 hours. Full rated output is 120-million.

FIRST PIG enters form for 50-lb unit. Plant is newest, most modern. Anaconda is proud of safety, air-contamination control, called "the best" known in the country.

shown in picture at right contain two 120-potlines. Each pot will produce 1,400 to 1,500 lb aluminum per 24 hours. With full operation, pots will be tapped every 24 hours.

First potline went into operation in August, with the second scheduled for some time in October.

Although first pig was not poured until the Aug. 15 ceremonies, plant began to be readied months ago. Recently completed was the "bake out," a period of 12 to 14 days when 90,000 amperes are passed from anode to cathode through coke and pitch anodes and pre-formed carbon lining material in the pots. The viscous anode material is baked to solid carbon, becoming an electrical conductor. Then, alumina in a flux of cryolite is placed in the pots.

Sales in the Market

A "substantial portion" of Columbia Falls annual output will be sold in the open market. Production will be divided among three other categories. Harvey Machine has an option to purchase a portion, Anaconda Wire & Cable Co. will consume some and another subsidiary, American Brass Co., will also take a portion of their requirements from the plant.

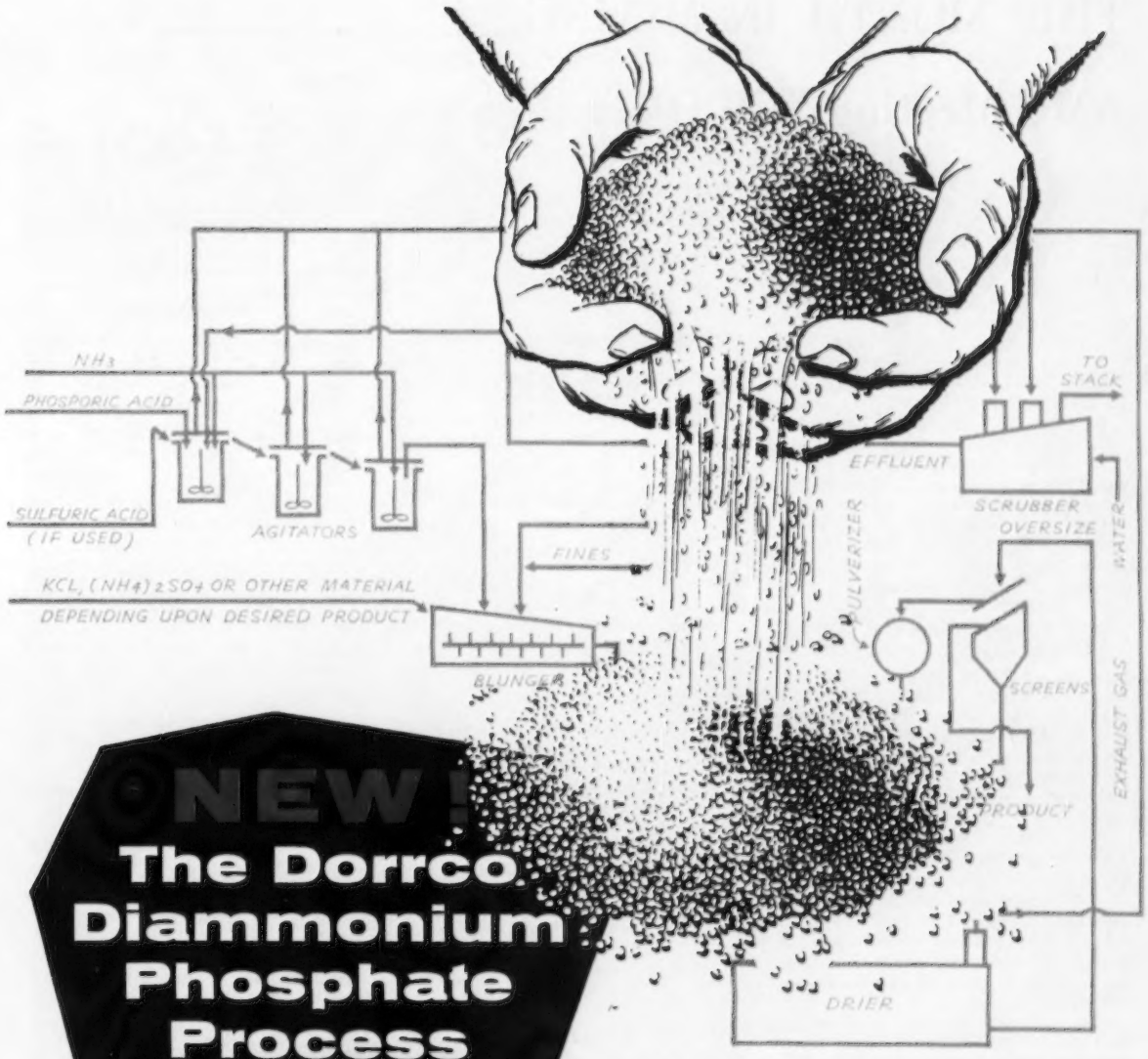
Anaconda Wire & Cable, which has five separate fabricating aluminum mills in the U. S., is already consuming sizable amounts in the manufacture of aluminum conductors. Newest of these, located at Great Falls, Mont., is almost completely automatic.

Says Mr. Caples, "Our primary sales goal for the Columbia Falls' output will be to sell the largest possible proportion to independent regular consumers of primary aluminum in areas where freight rates are reasonable."

Mr. Kelley, who was chairman of the board of Anaconda when the aluminum plant was conceived, and who was credited by many of the speakers as a major contributor to its success, discussed the meaning of the brand new installation to Montana, and said the new industry's future "will be expanded and become a potent factor in the economic development that is bound to come."

Said Mr. Glover: "It was Mr. Kelley who made the decision that this plant would be built; and the tougher the going . . . the more was his determination that Anaconda would do the job."

Welcoming address for the ceremony, largest of its kind in local history, was given by Gov. Aronson. Mr. Dwyer responded, devoting the major part of his talk to the excellent company-public relationship which his company enjoys.



NEW! The Dorrco Diammonium Phosphate Process

Proved out at Missouri Farmers Association Granular Fertilizer Plant...

The first commercial production of diammonium phosphate based fertilizers took place last November at the new MFA Fertilizer Plant near Joplin, Missouri. Full design capacity of 200 TPD was reached less than three months later. An improvement in the Dorrco Granular Fertilizer Process, this new method can be readily adapted to existing plants.

The Dorrco Diammonium Phosphate Process can produce directly from 32% P_2O_5 acid a fertilizer analyzing approximately 18-48-0 (N-P_2O_5-K_2O basis). Iron, alumina and other elements go directly into the product where they assist granulation. The use of dilute phosphoric acid, purification by filtration and crystallization are all avoided. Final product is composed of closely sized, spherical, free flowing granules and size can be controlled over a wide range by proper selection of screens. The presence of a small percentage of monoammonium phosphate insures stability of the product.

If you're interested in diammonium phosphate fertilizers, let us send an engineer to discuss this new development from the standpoint of economics and process. No obligation, of course.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

AMC Meeting Will Offer Policies

AMONG THE MANY FEATURES of the AMC convention will be a Declaration of Policy, representing the mining industry's views on national issues of major importance to the industry. Committee, which drew-up the policy was headed by Howard I. Young. Congress president.

A partial list of the many distinguished guests and speakers will include, Douglas McKay, Secretary of Interior; Arthur Fleming, director ODM; Charles Russel, Governor of Nevada; Barry Goldwater, Senator from Arizona; Frank W. Barrett, Senator from Wyoming; Clinton Anderson, Senator from New Mexico; Arthur Watkins, Senator from Utah; Henry Dworshak, Senator from Idaho; George Malone, Senator from Nevada; Thomas Martin, Senator from Iowa and Alan Bible, Senator from Nevada.

Policy Meeting

The full resolutions committee will meet in Las Vegas October 8 and 9 to draft the policy declarations in final shape for consideration by the convention. Report will be read in sections, at appropriate points during the convention, thus permitting the sessions to give full attention to these important industry policies.

After the registration on Monday morning, Howard I. Young, president of the American Zinc, Lead and Smelting Co. and president of AMC, will preside as chairman of the first session.

Each of the sessions will be preceeded by a motion picture, which will start anywhere from 20 to 35 minutes before the session begins.

Plant trips will be made to Mountain Pass Mine of Molybdenum Corp., Three Kids Manganese Mine of Manganese Inc., Western Electrochemical Co. and U. S. Lime Products Corp.

No registration fee. For hotel accommodations write Las Vegas Housing Committee, P. O. Box 1750, Las Vegas. For motel accommodations write to Frank Ellis, c/o Par-A-Dice Inn, 22217 Fremont St., Las Vegas.

OCTOBER 10

8:30 am Registration, Silver Slipper
10 am National Policies and the Mining Industry, Silver Slipper ballroom
12:15 pm Welcoming Luncheon, Venus Room, New Frontier Hotel
2 pm Labor and Management Problems; Public Relations Ramona Room, New Frontier
2 pm Milling and Metallurgy, Ballroom "A", Silver Slipper
2 pm Exploration and Geology, Ballroom "B", Silver Slipper
5:30 pm Barbeque and Western Party, Last Frontier Hotel

OCTOBER 11

9:45 am Public Lands Panel, Ramona Room, New Frontier Hotel
9:45 am Drilling and Roof Support Ballroom "A", Silver Slipper
9:45 am Uranium Milling, Ballroom "B"
12:15 pm Strategic Minerals Luncheon, Venus Room, New Frontier
2 pm Outlook for the Mineral Industries, Ramona Room
2 pm Improved Mining Methods and Equipment, Ballroom "A"
2 pm Uranium Exploration and Development, Ballroom "B" Silver Slipper

OCTOBER 12

9:45 am Tariffs; Taxation, Painted Desert Room, Desert Inn
9:45 am Open-pit Mining, Ballroom "A", Silver Slipper
9:45 am Uranium Mining, Ballroom "B"
12:15 pm Luncheon Meeting, Board of governors, Western Division, AMC, Banquet Room, Thunderbird Hotel
2 pm Stockpiling — Government Mineral Programs, Ballroom "A", Silver Slipper
2 pm AEC Policies—Outlook for the Industry, Ballroom "B"
2 pm Industrial Minerals, Theater, Silver Slipper
2 pm Gold and Silver Conference, Gay 90's Ballroom, Silver Slipper

OCTOBER 13

9:30 am Plant Trips
9:30 am to 5 pm Tax Forum for tax accountants and any mining men interested.

Mining Calendar

Southwest International Mining Association and New Mexico Mining Association. Sept. 29-Oct. 1, El Paso.

Regional meeting, AIME Mining Branch. Hosts, Black Hills Section. Rapid City, S.D., Oct 2-5. Members of CIMM are invited.

AIME Rocky Mountain Minerals Conference and fall meeting of MBD. Oct. 6-8. Salt Lake City.

American Mining Congress 1955 Metal Mining and Industrial Minerals Convention, Oct. 10-13, Las Vegas.

50th Anniversary Celebration, Illinois State Geological Survey. Urbana-Champaign, Ill. Oct. 11-12.

University of Minnesota Fourth Annual Drilling Symposium, Oct. 13-15, Minneapolis.

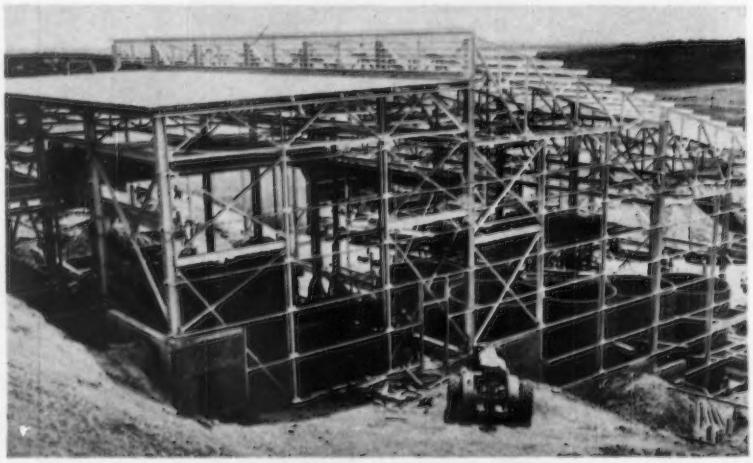
Conference on Mining Research, USBM and Missouri School of Mines. Oct 17-18 Rolla, Mo.

37th National Metal Congress Exposition Oct. 17-21, Philadelphia, Pa.

World Symposium on Applied Solar Energy, Nov. 1-5, Phoenix, Ariz.

Western Governors Mineral Policies Conference, Sacramento, Nov. 7.

Nuclear Engineering and Science Congress, Dec. 12-16, Cleveland.



MONTICELLO, UTAH, MILL of the AEC, will be expanded to the tune of $2-million when current operations end. Project includes erection of a complete new mill and alterations to old facilities. Plant, which will utilize raw leach process, will process carnotite ore and re-process tailings from vanadium operations carried on during World War II. H. K. Ferguson Co., Cleveland and San Francisco, is contractor. Photo shows grind leach building. Also under construction are resin-in-pulp plant, laboratory and auxiliary facilities. Completion is set for October.

General view during construction showing expansion of facilities for greatly increased production

Mammoth cranes used in erecting Kennedy 36 inch primary gyratory crusher

Giant receiving opening in new Kennedy 36 inch primary gyratory crusher

SOMERSET CHECKED THE RECORD

and again chose

KENNEDY

machinery and equipment

When Somerset Crushed Stone, Inc., first planned their present expansion program, they knew that more machinery and equipment would be required. As a result they checked a 10 year maintenance and production record on their KVS equipment.

The figures shown were so satisfactory and operating costs so low, they *again* chose Kennedy machinery . . . additional primary and secondary Gyratory crushers, screens, elevators and all auxiliary equipment needed to make their modern plant at Bernardsville, N. J., one of the largest aggregate producers in the State.

KVS engineers recommended the right equipment . . . developed flow charts . . . helped Somerset plan their new plant that exceeds rated capacities in all departments and operates at costs that are lower than original estimates.

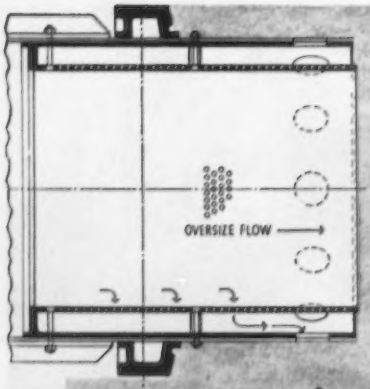
If you are planning expansion or modernization of an existing plant or contemplate erecting a new one, consult KVS—Our engineers are available any time, anywhere, to show you that KVS has the *right* equipment for any job.

IT COSTS LESS... TO OWN THE BEST

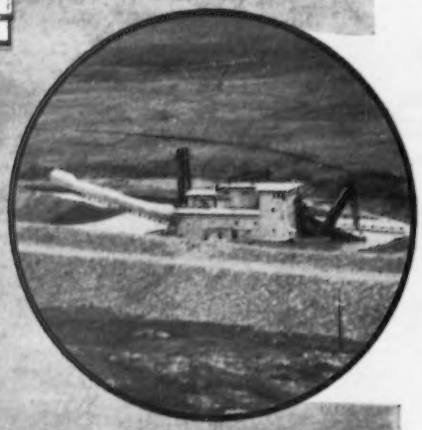
Send for bulletins describing KVS machinery and equipment.

KENNEDY-VAN SAUN

Manufacturing and Engineering Corporation • Two Park Avenue, New York 16, N. Y. • Factory: Danville, Pa.



First Olson trommel was installed in YUBA 8 cubic foot dredge (below) at Platinum, Alaska. This trommel (left) mounts in screen in area normally blanked out and increases capacity as much as 25% without lengthening screen.



GOODNEWS BAY REPORTS

4½ YEARS USE AND 5,000,000 YARDS HANDLED BY YUBA-BUILT OLSON TROMMEL WITHOUT DOWNTIME

L. F. Barber, chief mining engineer, Goodnews Bay Mining Co., writes:

"The Olson section installed in the 7½ foot Trommel Screen, Yuba Dredge No. 129, has now been in operation in excess of four and one-half years...almost five million cubic yards of material have passed through the screen.

"The Olson section was designed to provide additional screening area over the screen section normally blanked out by the lower tread ring and end plates. The effective screening area now extends nearly the full length of the screen, allowing additional flexibility in the routing of screened material over jigs and sluices in the recovery system. The ¾" Yuba Abrasion Resisting Steel internal perforated plates of the Olson section wear in excess of two mining seasons. Plates are changed during Spring repair every other year to preclude lost time during the mining season.

"Regardless of material—whether sticky clay, muck, overburden, fine sand or gravel—the Olson section has not plugged up nor caused any lost time since its installation in 1950."

FOR OLD OR NEW REVOLVING SCREENS

Olson patented trommels, made from ARS plate with holes taper drilled to size and spacings you need, can be field mounted in your present screen or built into new screens at the YUBA plant. In either case you increase screening capacity and effectiveness without lengthening screen. Send screen details, general arrangement, hole size and spacing for estimates. No obligation.

YUBA DREDGES — PROVED DEPENDABILITY AROUND THE WORLD

YUBA MANUFACTURING CO.

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CABLES: YUBAMAN, SAN FRANCISCO • SHAWDARBCO, LONDON

88

DMEA Exploration Applications Continue At Record Level

CONTINUED INTEREST IN URANIUM exploration kept the number of applications received by DMEA at a record level during the four months period from April through July. 183 new applications for assistance on all types of minerals were received during that period, bringing to 2,737 the number of applications received since the beginning of the program.

Of the total received to date, 1,233 have been denied, 487 withdrawn, 796 approved and 221 are being processed.

Exploration contracts were awarded during this period for copper-zinc and mercury in California; uranium in Colorado, Utah, New Mexico and Wyoming; lead-zinc and tungsten in Idaho; manganese, lead and uranium in Montana; manganese, tungsten and lead-zinc in Nevada; mica in Georgia and North Carolina; manganese and chrome in Washington and fluorspar in Illinois.

W. R. Grace & Co. Expands Rare Earths Program

DAVISON CHEMICAL CO. division and Rare Earths, Inc., subsidiaries of W. R. Grace & Co., have joined in a program of expanded production, sales, research and development of rare earths and thorium.

Rare Earths, Inc. has a plant in operation at Pompton Plains, N. Y., for processing monazite sands. Additional facilities are being installed at Davison's Curtis Bay works, Baltimore. Dr. Allen T. Cole, former manager of Florida Phosphate division, has been named manager of Davison's newly formed Atomic Developments department.

New activity fits in with Davison's long-established phosphate business, since monazite contains as much phosphate as Florida phosphate rock. In processing monazite sand, sulphuric acid is used and recovered and phosphoric acid is derived as by-product.

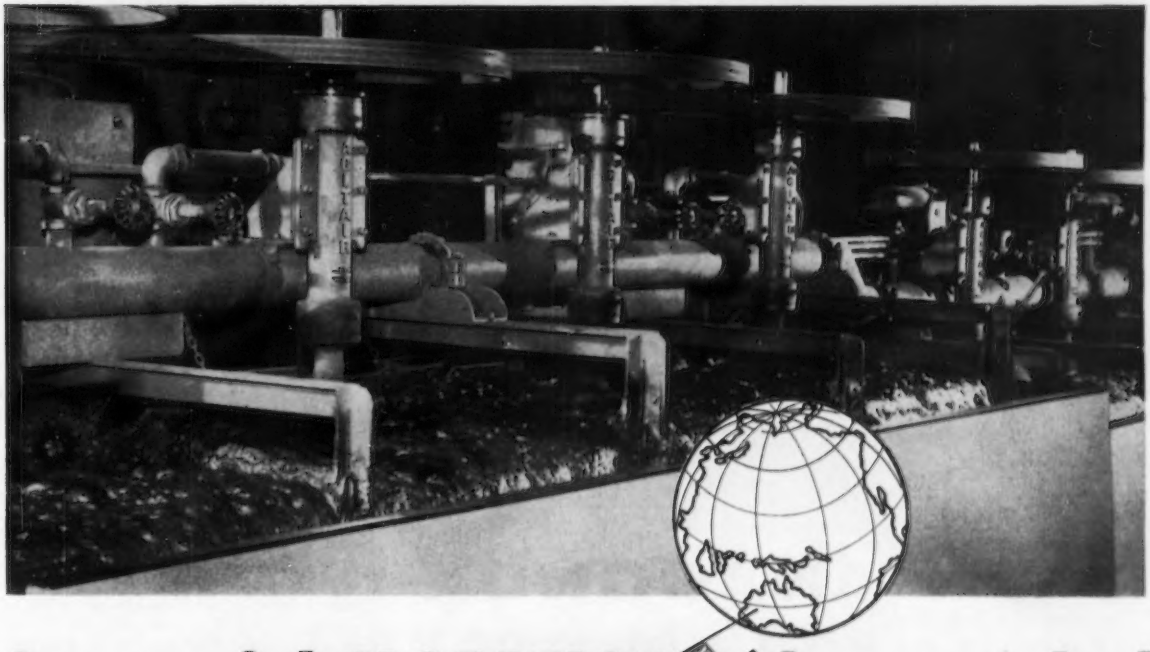
Monticello Ore-Buying List Revised by AEC

Announcement

ORE-BUYING SCHEDULE for the Government-owned and American Smelting & Refining Co.-operated uranium processing plant at Monticello, Utah, has been altered. When current construction is complete the mill will have both acid and carbonate leach circuits.

Carnotite and roscoelite ores that meet Circular 5, Revised specifications will continue to be purchased under provisions of that circular. Ores such as high-lime that do not meet Circular 5 specifications, may be purchased under special ore buying contracts; providing the ores have suitable metallurgical characteristics.

AGITAIR is there!



Successful FLOTATION 'down under'

Example 1

When obsolescent equipment moves out, AGITAIR moves in! A recent example "down under" is a large refractory gold operation at Kalgoorlie in Western Australia, where obsolescent cells have been changed to the AGITAIR flotation principle. An experimental unit showed such excellent results that additional units were immediately ordered.

Example 2

Another triumph for Agitair has been chalked up at Broken Hill—also in Western Australia—one of the largest lead-zinc districts in the world. After 20 years of operation, a program of modernizing has replaced old machines and methods with streamlined Agitair Flotation. The new efficiency has met every assurance of Galigher engineers.

In Australia, as in nearly every other important metallurgical center of the world, the Agitair principle of recovery is being successfully applied. Ask for a summary of the comprehensive Galigher service. No obligation.

Leaders in Experience and Service

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Geary Reagent Feeder
Laboratory Pressure Filter

The tough ones come to **Card**

ANACONDA
solves maintenance by car standardization

Over 15 years ago, the Anaconda Copper Mining Co. came to Card seeking the engineering of a side dump ore car that could serve a wide scattering of mine properties in Montana. Design requirements submitted by Anaconda called for long life in underground heavy-duty haulage and highly corrosive conditions.

About 1200 Card Granby-type cars are now in service in Anaconda's Montana operations. The latest designs differ in minor aspects from the original order, but all have proved highly satisfactory. The 115 cu. ft. car on 36" gauge has a high capacity to length ratio, keeping trains short. For maximum capacity, doors and back are internally braced. To ease loading shocks, the trucks are coil spring mounted, and the use of Card heat treated cast steel wheels with Timken bearings assure extended wheel life and easy haulage. Card engineers are happy to consult on any haulage problem. No obligation.

C.S. Card Iron Works Co.
2501 WEST 16TH AVE.
DENVER, COLORADO

This Month *(Continued)*

Payment for high-lime ores will be made under whichever of the following schedules the buyer determines will give the shipper the greatest return. Schedule I calls for prices as set forth in Circular 5, Revised; except that a deduction of one dollar per dry ton; plus 30c per dry ton for each 1% lime in excess of 6%. Schedule II uses Circular 5 as base and deducts a flat $3.70 per dry ton and makes no payment for vanadium.

AEC Head Cites Prices of Atoms-For-Peace Fuels

ADM. LEWIS E. STRAUSS, AEC chairman, announced in Geneva during August the sale prices of fuels and other materials for atomic research piles. Prices, formerly kept secret, were disclosed to permit designers of the 27 nations participating in President Dwight D. Eisenhower's Atoms-For-Peace plan ot estimate costs for their individual programs.

Strauss noted at a press conference, according to the New York *Herald Tribune*, that the prices were "not true costs", since those would disclose U. S. production rates, but were fair prices.

Prices announced were: for uranium containing 20% U-235, $25 per gram of contained U-235, or $11,362 per lb; for uranium metal, $40 per kg. or $181 per lb; for heavy water, $28 per lb.

Southwest Potash Expands

SOUTHWEST POTASH CORP., operating in the Carlsbad area of New Mexico, and a subsidiary of the American Metal Co., plans to increase its capacity by one-third at an estimated cost of $2.5-million. New production is expected to become available about February 1956.

USBM Helium Plant

BUREAU OF MINES announced that it will build a $6-million helium plant at Exell, near Amarillo, Texas. Director John J. Forbes said the demand for helium by the Armed Forces, the Atomic Energy Commission and private industry exceeds current production. The new plant will have a capacity of 100-million cu ft of helium a year. Present capacity is 85-million cu ft a year.

Reynolds Metals to Boost Primary Aluminum Capacity

REYNOLDS METALS CO. plans to increase its primary aluminum capacity to 550,000 tons, according to an announcement by Richard S. Reynolds, Jr., president of the company.

About $200-million will be spent to add 135,000 tons of primary capacity, including new bauxite mines in Haiti and Jamaica, and a coal-burning power plant in the Ohio Valley. The remaining $30-million in the expansion program will be used for fabrication facilities, princi-

BIG payload capacity

(obtained with USS COR-TEN steel construction)

pays off on 54-mile delivery haul

Motor Freight, Inc., of New Philadelphia, Ohio, hauls coal under contract from mine to chemical plant 54 miles away. In such an operation, the bigger the payload the bigger the payoff because it means more coal hauled in fewer trips.

That's why they bought this two-trailer hopper train with USS COR-TEN Steel used in thinner sections to cut down dead weight. This equipment weighs only 29,500 pounds empty, yet can carry 48,500 pounds of payload and still meet the Ohio legal gross weight limit of 78,000 pounds. The result, lower costs per haul, more profit for the hauler.

Says Robert Ress of Motor Freight, Inc., "This unit has been in operation only since February but has already hauled almost 8,000 tons at an average of 23.4 tons per load. We expect at least 8 to 10 years of service from it. Our future trucks will be of the same COR-TEN Steel construction."

USS High Strength Steels—USS COR-TEN, USS MAN-TEN and USS TRI-TEN—can be used singly or in combination to replace carbon steel in the vital parts of your equipment to (1) increase the service life without increasing dead weight, or (2) reduce equipment weight without reducing its strength, or (3) increase the size and capacity of equipment without increasing the total weight or the power needed to move it.

Call or write for more information

62% of the gross weight is payload. This equipment, loaded with fine coal, is ready for a 54-mile run from a coal mine owned by the Columbia-Southern Chemical Corporation, a subsidiary of Pittsburgh Plate Glass Company, to the company's plant in Barberton, Ohio. The Marion Metal Products Co., builders of this new hauler, reduced dead weight by using USS COR-TEN Steel in thinner sections, and provided lasting strength and long life because COR-TEN Steel has 4 to 6 times the resistance to atmospheric corrosion of structural carbon steel.

NOW AVAILABLE—Our new "Design Manual for High Strength Steels" is ready for distribution. This excellent book contains comprehensive and practical information that you will find extremely useful in designing your product for greater economy and efficiency by the sound use of high strength steels.

For your free copy, write on your company letterhead giving your title or department to United States Steel Corporation, Room 4896, 525 William Penn Place, Pittsburgh 30, Pa.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

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When you next need a diamond drill bit which no formation will slow up, gives full core recovery, faster penetration *AND* saves you *days* and *dollars* in coring and drilling, contact your nearest J. K. Smit field representative or write us direct for literature and assistance.

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J. K. SMIT & SONS, INC.
HOME OFFICE AND PLANT
MURRAY HILL NEW JERSEY

Additional plants in London, Paris, Amsterdam and Toronto, Canada

This Month *(Continued)*

pally for the modernization and enlargement of present plants.

"Application has been made to the Office of Defense Mobilization for tax amortization certificates covering the primary producing and related facilities," Mr. Reynolds said.

In other developments, the company sold $155-million of 25-year first mortgage bonds to institutional investors and placed an $80-million five-year unsecured bank loan. The proceeds of the financing together with $10,517,000 of the company's cash were used to refund all hte company's mortgage and loan indebtedness. The refund indebtedness included obligations to GSA for war surplus plants and for aluminum expansion programs during the Korean war.

IN THE U.S.

ALASKA

Climax Uranium Co., subsidiary of Climax Moly, has moved onto the Ross-Adams uranium property with a crew and is doing preparatory work. A helicopter has been engaged and a drill has been flown to the prospect. Some neighboring claims have been finally filed, and it is now publicly known that the area is in the vicinity of Moira Sound, Price of Wales Island.

U. S. Steel Co. is carrying out an ambitious core drilling and geology project at Union Bay, Cleveland Peninsula. Three drills are being used on a two-shift basis. Surveyors and geologists are covering the surrounding area.

Klukwan Iron Ore Corp. is diamond drilling the lode at Klukwan in addition to the churn drilling of the placer portion of the iron as reported earlier.

Moneta Porcupine Mines, Ltd., of Toronto optioned the Red Top mercury mine on Marsh Mountain, near Dillingham. They are driving a shallow adit and propose to do 200 to 400 ft of underground work at that level. If the results warrant, they will drive a lower level adit and do more extensive work.

ARIZONA

San Francisco engineering firm of Western-Knapp Engineering Co. has been awarded a contract for construction of a $4.7-million addition to the Hayden concentration mill of Kennecott Copper Corp., headquartered at Ray.

New plant is scheduled for completion in the spring of 1957, and will be a leach-precipitation-float addition to the present mill. Present recovery is limited to sulphide copper. New system will permit recovery of oxide copper minerals from Ray ore and recover an average of about two additional pounds of copper from each ton of ore processed.

TOGETHER YOUR EXPLORATION

TD-14A Skid-Shovel Leads Double Life

3-TON LOADS of iron ore are moved from stockpile to haul trucks each trip by TD-14A Skid-Shovel in approximately 70 seconds. The 66 drawbar horsepower TD-14A supplies power for deep shovel penetration into ore pile. Skid-Shovel then rolls back at ground level quickly to retain heaped load—which is moved at ground level in high gear—and places a nine-ton load into trucks every 3½ minutes.

INTERNATIONAL DROTT Skid-Shovel loads trucks, salvages ore, helps maintains 7,000-ton monthly output at reopened iron mine

After standing idle for 30 years, an old iron ore mine is being reopened at Emory Gap, Tennessee, by the Walt Mining Company with a big assist from a TD-14A INTERNATIONAL DROTT Skid-Shovel.

This 66-horsepower front-end loader actually leads a double life . . . loads 9 tons of loose iron ore into haul trucks in 3½ minutes . . . salvages ore that has become mixed with dirt on the strip. This second operation is accomplished by quickly changing the standard Skid-Shovel bucket to a Rock Fork which permits a sifting method of ore reclamation.

The four sizes of INTERNATIONAL DROTT Skid-Shovels are opening up broad new areas of profitable operations in the entire mining field. They load trucks faster and more economically than any other loader. Yet that is but one job on which these units pay big returns.

Use them for stripping, cleaning the seams, recovering scattered ore deposits . . . and scores of other jobs that need doing at lowest cost on your diggings.

First, test the versatility and great workpower in these loaders at absolutely no cost or obligation. Just call your INTERNATIONAL Industrial Power Distributor. He'll demonstrate any of the four models—TD-6, TD-9, TD-14A and TD-18A. You just look, compare and see if you can afford not to have one of these machines working for you.

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WHATEVER YOUR EXPLORATION OR MAPPING PROBLEM....

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Want thousands of acres mapped quickly for geologic studies? AERO crews, now working in many parts of the world, are available for large scale photo-mapping, or for magnetic studies with the high sensitivity airborne magnetometer. Millions of miles of experience enable AERO to survey swiftly and economically for you over any terrain.

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When a close-up look at promising areas is indicated, AERO flies tree-top level magnetic surveys which are more significant and less costly than ground studies. Unhindered by jungle, mountains or muskeg, AERO surveys go forward speedily by helicopter . . . provide magnetic records of uncompromising accuracy.

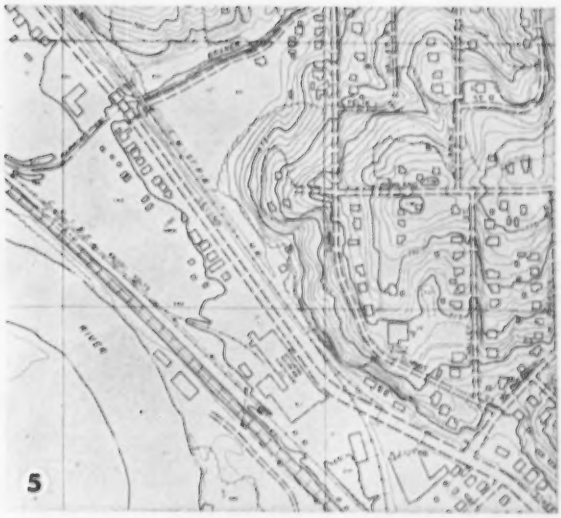
❸ Operational Teamwork

With AERO mapping, precise magnetic data can be studied at the end of each day's flying. This makes it worthwhile for the chief geologist and other members of your management to become part of the prospecting team. AERO crews are pleased to have clients "looking over their shoulders". They work responsibly and well with your staff.

❹ Photos for Planning

AERO photo-maps provide a preliminary look at areas for regional trends and surface geology. Our staff includes experts in photo interpretation and geologists of wide practical experience. We have helped to uncover major finds of iron, ore, asbestos, chrome, titanium and other important minerals.

call on AERO's worldwide experience and service



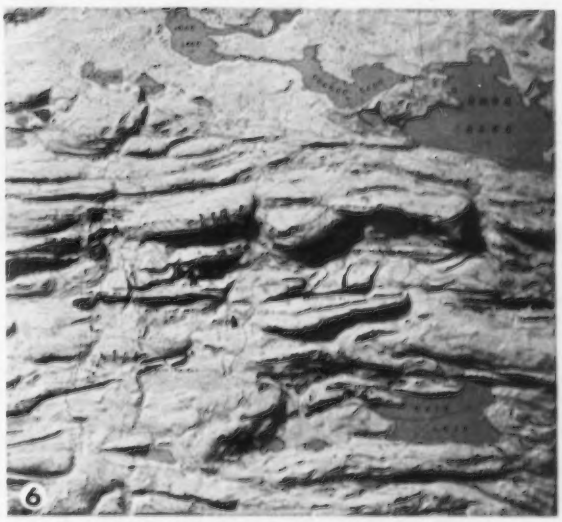
⑤ Dependable Topographic Facts

Planning a new development? AERO delivers accurate topographic maps in a fraction of the time, at a fraction of the cost of ground methods. You get quick answers to problems of road, rail line and housing location, plotting property lines and other engineering work, and you conserve the valuable time of your own engineering staff for other important work.

⑥ Relief Models

Want the green light on a large project from non-engineering members of the management team? AERO relief models are far more understandable to the layman. Accurate models, molded in durable Vinylite provide a complete picture of the terrain problems—useful in management decisions and as a public relations tool.

It will be well worth your while in the planning stages of your next exploration or mapping project to call on the varied skills and experience of AERO*—pioneer and leader in aerial surveys. Let us meet with you.*



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For uninterrupted traffic in air or water, there's no better vehicle than Naylor light weight pipe. Naylor lines are easy to install, particularly with the Naylor one-piece Wedge-Lock coupling to speed connections. Naylor pipe gets around wherever you need it. Its light weight assures economy, and its exclusive structure provides the extra strength and safety required for dependable service. Sizes range from 4" to 30" in diameter with all types of fittings and connections.

Write for Bulletin No. 507.

NAYLOR PIPE

NAYLOR PIPE COMPANY

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Arizona *(Continued)*

Frontier Mining Co. has announced first shipment of uranium ore from its Sunny-Side claims on the Navajo Indian reservation in Apache County.

Frontier president Charles Bristle announced that the company now has approximately 100 tons of uranium ore stockpiled and shipments of 15 tpd are moving to the Kerr-McGee mill at Shiprock, N. M., 82 miles from the mine.

Bristle said that pre-shipment assays of the ore averaged 0.35% uranium with 3% vanadium.

Ore storage and truck repair yards have been set up at Wickenburg by Wells Cargo, Inc., of Las Vegas, Nev. Company plans ore hauling on a large scale following closing of the Wenden manganese stockpiling depot.

Al Stovall of Phoenix, owner of the Stovall-Apache manganese mine, one of the biggest individually-owned mining enterprises in Gila County, is installing a 500-ton portable mill at a reported cost of $175,000.

He expects to begin shipping concentrates about Oct. 1.

Stovall has an investment of more than $250,000 in the mine which has been worked for about 20 years. About 20,000 tons of ore has been stockpiled with stockpiling continuing at the rate of about 700 tpd.

Once the mill is in full operation, trucks will move concentrates to the railroad for shipment under the Federal carlot manganese program to Avondale, Colo., where the concentrate will be stockpiled by Colorado Fuel and Iron.

CALIFORNIA

Idaho Maryland Mines Corp. disclosed it has received a "substantial loan" from one of its major stockholders, which came on the heels of an annual report showing a 1954 loss of $471,372.

The loan will permit operations to continue, and will enable the firm to:

1. Liquidate all trade accounts.
2. Develop promising tungsten deposits on the 900 level of the Grass Valley mine. Firm has applied for a $30,000 Government loan to aid this undertaking.
3. Carry on an exploration program on the 3,000 acres of uranium prospects leased by the firm on the Colorado Plateau.
4. Continue processing some 30,000 tons of broken gold ore in stopes of the Idaho-Maryland mine.

A resumption of quicksilver mining is expected soon in the Tehachapi area of Kern County following a lapse of almost 20 years.

Western Mercury Mining Co. plans to return to operation the Cuddeback mine near the famed Tehachapi Loop on Southern Pacific Co.'s main line, 7 miles northwest of Tehachapi.

Millionaire Vernon Pick has selected Saratoga, on the San Francisco Peninsula,

B.F.Goodrich

Tires carry 40 tons of coal over 25,000 miles of rocks—ready for more

ONE of the world's largest strip mines is operated by the United Electric Coal Companies at DuQuoin, Illinois. Here fleets of trucks carry 40-ton loads of coal from rock-strewn pits over long haul roads made of abrasive slate. Tires could be chewed to pieces quickly, running up huge maintenance costs, running down production.

United avoids these problems with B. F Goodrich tires, reports they have averaged 25,000 miles already with less than half their service life gone!

All-Nylon cord body

Universal tires can take this kind of punishment because they're now built with an *all-nylon* cord body (size 12.00 and larger, smaller sizes in rayon or nylon). Nylon is stronger than ordinary cord materials, can withstand double the impact and resist flex breaks.

Under the tread is the patented B. F. Goodrich nylon shock shield. Layers of strong nylon cords stretch together to absorb shocks and protect the tire body Universal tires wear longer; more tires can be recapped. You pay nothing extra for this nylon shock shield.

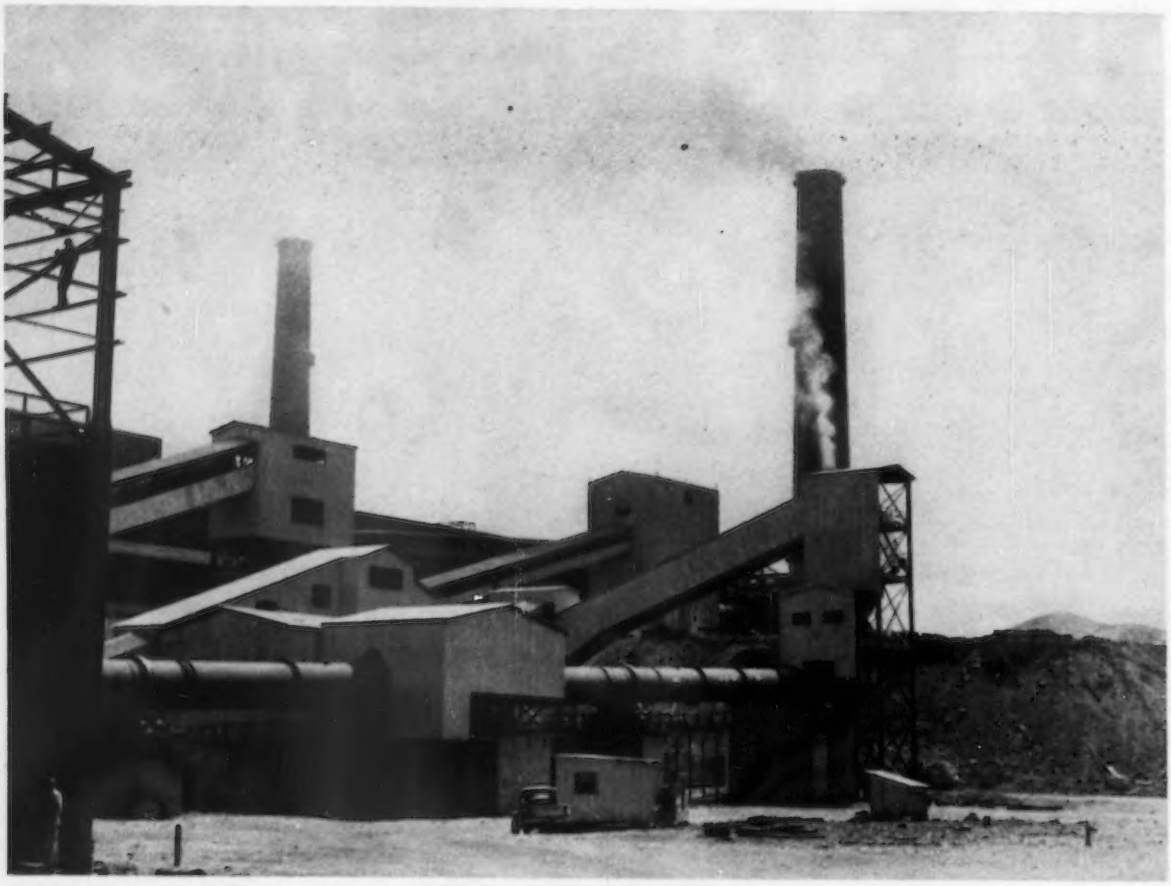
See your B. F. Goodrich representative today and find out how you can get longer tire service at lower cost in your mine work. The address is listed under Tires in the Yellow Pages of your phone book. Or write *The B. F. Goodrich Company, Tire & Equipment Division, Akron 18, Ohio.*

Specify B. F. Goodrich tires when ordering new equipment

UNIVERSAL TREAD resists rock cuts and bruises. Wedge-shaped cleats defy slippage, pull in either direction.

OVER-ALL VIEW of the giant DuQuoin mine. It's one of 6 operated by United in Illinois and Kentucky

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER



6 Miles of Traylor Rotary Kilns Prove Traylor Design Pays Off in the Long Run

In the past 14 years, Traylor has built almost 1 Rotary Kiln a month. A total of over 150 "Traylor-Made" kilns, with a combined length of more than six miles, are currently engaged in the processing of some 21 different products. Proved Traylor advantages such as all-welded shells, full-floating riding rings, single support type roller bearings are pointing the way to profitable production for mining men all over the world.

Traylor Rotary Kilns are custom-engineered and built to individual specifications for each installation. Sizes range from the smallest diameter and length up to 12′ in diameter by 450′ in length. Send for Traylor Kiln Bulletin #1115 which contains complete description, illustrations and specifications. Copy is yours on request.

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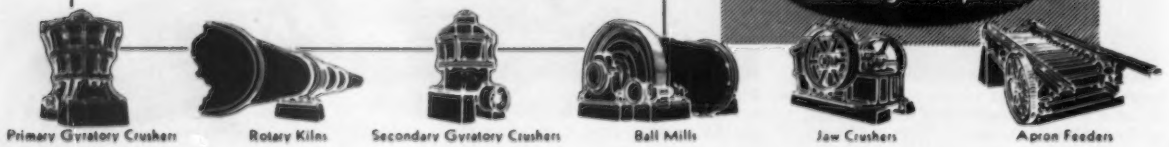
A Traylor leads to greater profits



Primary Gyratory Crushers · Rotary Kilns · Secondary Gyratory Crushers · Ball Mills · Jaw Crushers · Apron Feeders

California *(Continued)*

as site for an electronics research laboratory.

A $200,000 laboratory is under construction on an 830-acre ranch which Pick purchased for $105,000. Aug. 10 was occupancy date for the new laboratory, which replaces the one maintained by Pick in Grand Junction, Colo. Called Saratoga Laboratories, a division of Pick Enterprises, it will be staffed initially by 15. The staff is expected to be expanded to 100 in 18 months.

Laboratory will be used for development of radiation detection devices, and is equipped for limited production.

Tungsten production at Wah Chang Mining Corp.'s mine near Bishop has been increased from 200 tons to between 400 and 500 tpd, according to company officials. Increase was made possible by completion of a 12-mile power line from Owens River gorge to the mine site.

Southern Mine & Milling Co. of Phoenix, Arizona, and Atlanta, Ga., has agreed to pay $4.8-million in cash and royalties for 47 uranium claims near Wheeler Hot Springs, Ventura County. Claims were acquired from J. Paul Bursey & Associates, H. T. Tooley & Associates, of Santa Paula, and Ted Brown & Associates of Ventura. Development of the claims is scheduled to start in late August or early September.

Calute Minerals, Inc., Bakersfield, has taken an option on four uranium claims owned by E. A. Stickel of Lancaster in the Rosamond-Mojave mining district.

Calute agreed to pay the lessor 10% gross value royalty and 50% of any AEC bonuses if the option is exercised. Claims are the Gary Nos. 1, 2, 3 and 4.

At a special meeting of stockholders of Rimrock Uranium Corp., Salt Lake City, held in Los Angeles, it was voted to merge the company with Red Hill Mining Corp. of San Francisco, according to a joint announcement by Jack Turner, general manager of Red Hill, and Leon Frazier, president of Rimrock.

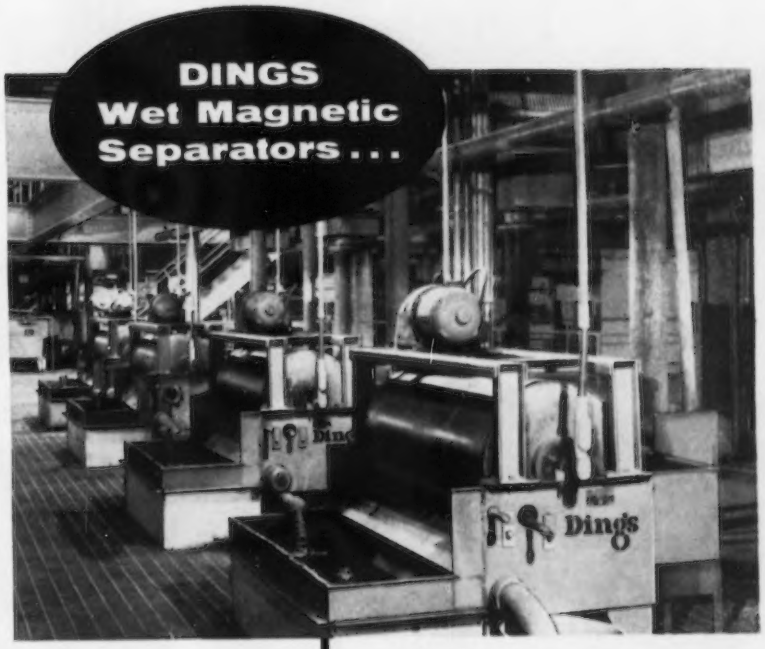
Merger involves $5-million worth of uranium property in Colorado, Utah and New Mexico, according to the announcement. Rimrock shareholders will exchange each two shares for one.

In the Boron area of Kern County, preparations are being made for renewed operation of a borax mine belonging to the estate of the late Harvey S. Mudd. Mine will be operated under a new company name.

Major mine operation will soon be under way in the California Hot Springs area near Porterville, says Gold Shares, Inc., which has a 50-ton mill currently under construction.

Mill was designed by MacAfee & Co., consulting engineers and metallurgists of Los Angeles. Crushing section is designed for 100 tons. This allows for expansion with plans ready to handle a future increase of 50 tpd.

Completion of the mill is expected in mid-September, with the milling of high-grade tungsten (scheelite) ore to start immediately thereafter.



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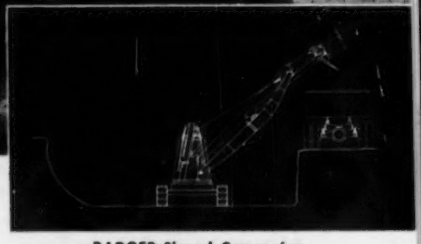
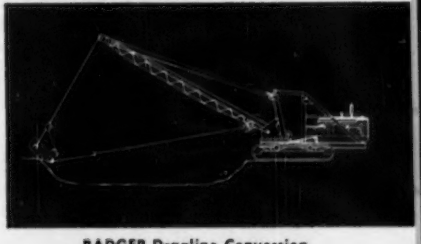


BADGER Shovel Conversion



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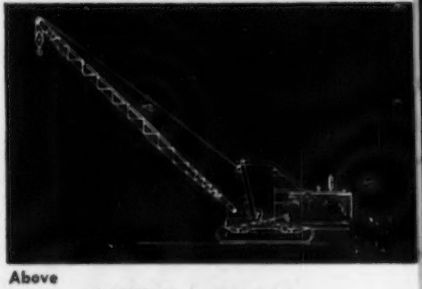
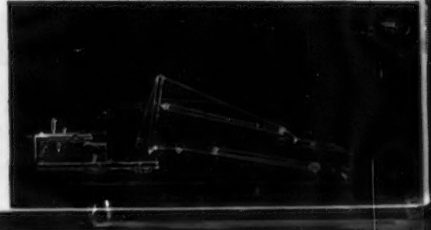


Above
BADGER Crane Conversion
Below
BADGER Trench Hoe Conversion



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Colorado *(Continued)*

California *(Continued)*

The milling operation will be the central activity on a 1700-acre leased property once known as Tyler Ranch. Abundant portable water is available. Adequate power and telephone facilities are being installed.

COLORADO

Principal stockholders of the former Plateau Mining Co. received a $222,500 cash payment in July from Federal Uranium Corp. The payment was for their shares in Plateau Mining Co., which was sold in July 1954 to Kentucky-Utah Mining Co. Kentucky-Utah later merged with Federal.

W. D. Nebecker Jr., president of Federal, said a further payment of $110,000 would be made to minority stockholders in August.

Plateau Mining controlled 3,300 acres of uranium land in the Yellow Circle area, 20 miles southeast of Moab, Utah.

Leon Henderson, economist under the late President Roosevelt, now is in the uranium business.

Henderson is the new president of American Leduc Uranium Corp.

Company expects to have three mines producing by Sept. 1, he said; all are on Outlaw Mesa.

American Leduc also has properties in Utah, Wyoming and New Mexico.

Continenatl Oil Co.'s $20-million expansion in oil exploration, processing and marketing in Rocky Mountain states this year includes uranium prospecting, president L. F. McCollum of Houston said.

McCollum would not locate the company's uranium exploration but said it was "principally in Rocky Mountain area."

He said Conoco has been experimenting in uranium exploration and has developed what the firm believes are "hot" techniques.

"We are in the business of producing energy and fuel," McCollum said, "and we are trying to get a background of knowledge and experience in the uranium field. At the moment we don't see uranium as immediate serious competitor to oil as a source energy."

Signing of a contract by the U. S. Atomic Energy Commission and Trace Elements Corp., Grand Junction, for construction and operation of a uranium ore-processing plant at Maybell was announced at the Grand Junction Operations Office of the Commission. Maybell is on the Yampa River in Moffat County in northwestern Colorado.

New plant, to be constructed, owned, and operated by Trace Elements, will process uranium-bearing ores from northwestern Colorado including ores owned, leased, or controlled by the corporation, as well as ores purchased from independent producers.

Durango's city dump, on Horse Gulch east of the city, may be the scene of a uranium strike.

Bill Crabtree and Nat Mahan, engi-

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Crescent on boom machine dumps large load of wet peat. Bucket is gravity-returned on track cable to digging point. Ask for Catalog J-1 and Field Report 219.

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Colorado *(Continued)*

neers with the Bureau of Reclamation, spotted a fault in the area while dumping garbage and obtained a mineral lease from the owner, W. D. Ewing. A later check-over with a scintillometer revealed a high count, and a drilling program now is being considered.

Archie Garwood, co-owner of G & G Mining Co., Cortez, said that firm has abandoned its uranium activity on the Salmon River in Idaho.

Garwood said one shipment was made from the widely-publicized strike, but that "it wasn't worthwhile to continue."

First commercial shipment from the Stumbling Stud uranium property in Huerfano County near Walsenburg was made in July. 17-ton shipment went to the mill at Grants, N. M.

Colorado Plateau uranium operators lauded a bill introduced in Congress in July which would make possible some compensation for miners who produced uranium between 1939 and 1948 without being paid for it.

Uranium was being used during the period, but was officially worthless and payment was made only for vanadium.

Stephen L. R. McNichols, Colorado lieutenant-governor and attorney for the Uranium Ore Producers Association, said the bill was an "excellent one." It has been estimated that as many as 300 miners might benefit from the bill, and that the total settlement may run into millions of dollars.

Continental Uranium, Inc., announced acquisition of two new uranium properties in joint venture deals.

In one, Continental and Minerals bid $187,000 for four tracts totaling 459 acres on the Spokane Indian reservation in Stevens County, Wash. A drilling program now is being planned.

In the other deal, Continental and Coliowa Uranium Corp. leased 40 claims near Jamestown, Colo., near Boulder, in a 50-50 deal. Jamestown properties are said to hold autenite, which will be mined in conjunction with gold and silver by Continental.

Gruenwald Mining Co. of Placerville, will develop some copper mines above Placerville, according to Lloyd Kurtz, project manager. They will use the mill erected by the Bachelor Corp. and may do some custom milling also.

Globe Hill Mining Co. of Colorado Springs, continues prospecting its S & B group of 23 claims, situated in San Miguel county, which it holds under lease. Thirteen holes have now been drilled at from 50 to 250-ft intervals, through the upper ore strata. Depths of holes range from 85 to 350 ft and total drilling to date amounts to 1,679 ft. One of the holes, drilled about 150 ft uphill from the outcrop encountered good mineralization. "This has encouraged us to start driving a tunnel from the outcropping ore showing in the direction of that hole," says the manager.

E.W. Ohlson, president of Wet Mountain Mining, Inc., announced that 15 tons of

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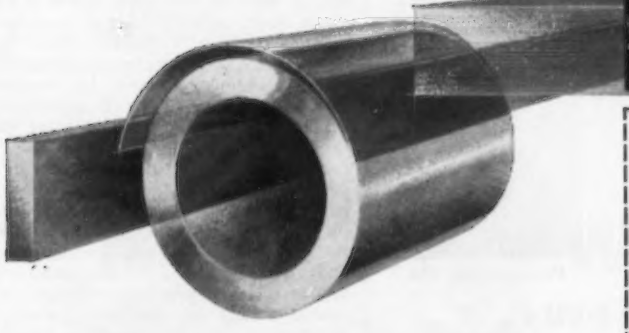

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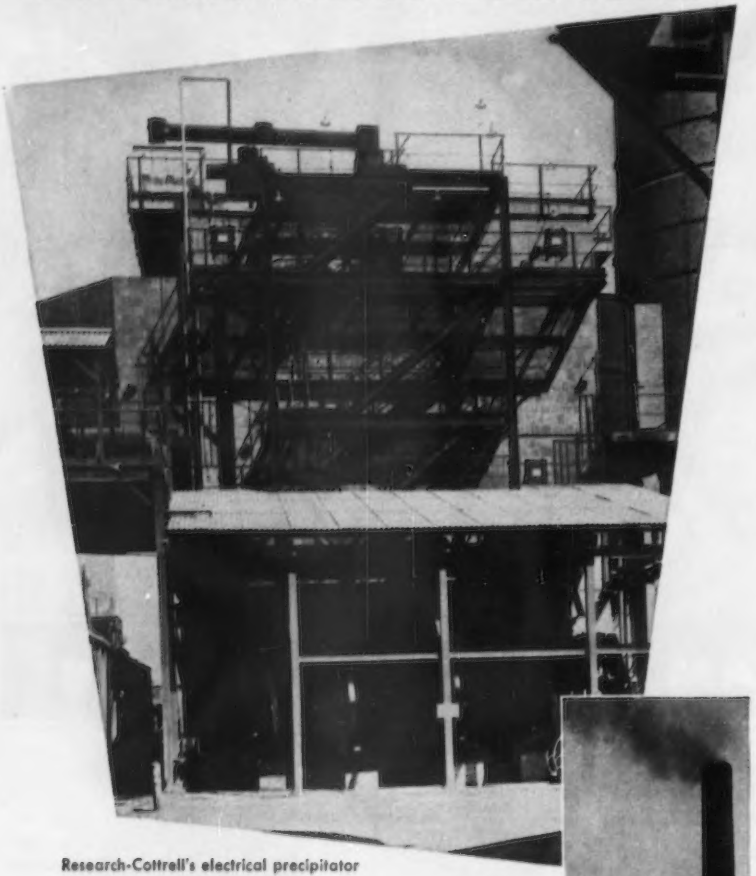
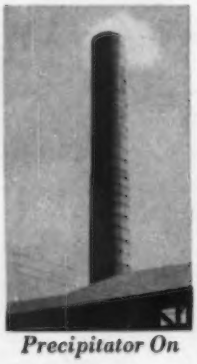


Research-Cottrell's electrical precipitator installation at the Palmerton, Pa. plant.

Precipitator Off



Precipitator On

The two photographs (right) show the results of this Research-Cottrell installation. The smoke in the picture at the top (Precipitator Off) consists of dry dust and fume entrained in the zinc ore sintering machine gases.

The picture at the bottom (Precipitator On) shows nothing but water vapor escaping from the same stack.

If you have a fume problem that involves recovering valuable materials that are going up the stack or combating a smoke nuisance, get in touch with your nearest Research-Cottrell representative. His experience with over 300 roaster and metallurgical precipitators will enable him to advise you on the most effective—and economical solution to your problem.

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Colorado *(Continued)*

highgrade thorium ores, suitable for immediate shipment, have been stockpiled at the company's Tuttle, Hastings and Mann leases. A contract was negotiated with the Lindsay Chemical Co. to take 5 tons of 10% thorium concentrate per day from Wet Mountain's holdings.

Thorium has been dominating the mining news headlines during the past few weeks and a boom is foreseen for the grey metal. Interest in thorium was first aroused by the announcement of the construction of a thorium mill for Gunnison county, Colorado, by Thorium Corp. of America in cooperation with Colonial Uranium. Thorium is radioactive, emitting, like radium, alpha, beta and gamma rays.

Uranium division of Golden Cycle Corp., Colorado Springs, has produced 6,903 tons of ore worth $231,955 since starting production in March 1954. Gold production from the Ajax mine in the first half of 1955 totaled 12,702 tons worth $472,789 compared with 13,100 worth $494,875 in the last half of 1954. For the respective periods, production from the Cresson mine was 15,538 tons worth $210,362 and 13,914 tons worth $230,322.

Mining in Gunnison County will expand when full production is expected to open at the beryllium mine on Willow Creek, by the Willow Creek Mining Co. The mine will mainly ship tantalum and columbium. Beryllium will also be produced. Company has Government contracts for 15-million pounds of the materials, and the ore is shipped by truck to Custer, S. D., to a Government purchasing plant there.

Gunnison County's mineral resources appeared headed for a new development with an announcement that lithium ore reserves in the county were estimated at 1.5-million tons. One lithium find was reported to belong to the U. S. Lithium Corporation of Salt Lake City and is located in the Wood Gulch and Box Canyon districts northeast of Parlin. Company was also reported to have built roads and brought in core drilling equipment and other machinery.

Placer mining is expected to get underway at once on manganese claims at the Black Bunny mines just east of the monument at the top of Rabbit Ears pass. Development work, begun last November by the present mine partners, has resulted in a $130,000 operation. It includes installation of a heavy media plant for processing ore.

$80,000 plant is a comparatively new system for processing manganese and is expected to handle 300 tpd ore when operating at full capacity, probably within the next 30 days. Principal partners are Paul Clark, Denver businessman, and Jess Hears, who is general manager and executive vice president for Wright Engineering in Denver. Clark is general manager of the Black Bunny mine.

Receipts of gold at the Denver mint in June topped like 1954 volume for the first time in several months, mint officials

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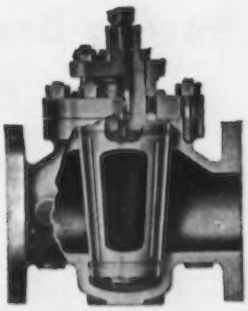

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Colorado *(Continued)*

report. Gold receipts in June were up to 68,176 oz, worth $2,396,174, from 61,259 oz valued at $2,144,085 a year before. For the first six months, however, receipts of gold were down to 389,410 worth $13,629,363, this year from 470,578 oz worth $16,470,231 in 1954. Silver receipts for both the month and half year continue far ahead of 1954 volume. June receipts were up to 718,014 oz worth $649,829 from 233,348 oz worth $211,152 and the six month figure was up to 3,828,051 oz valued at $3,464,044 from 1,420,801 oz worth $1,285,404. The great rise in volume of silver is mainly due to greatly increased silver recovery by Kennecott Copper Corp. in Utah.

Annual report of state mining commissioner, Walter S. Scott, revealed that the Colorado uranium industry produced minerals worth $118-million last year. He said that uranium has become by far the most important mineral in Colorado's history. At the end of 1954, Colorado contained an estimated 80% of the known valuable uranium deposits in the United States.

Continental Uranium, Inc. will build a 200-ton uranium ore processing plant near Moab in San Juan County, Utah. License arrangements have been made on the Burwell process of treating uranium ores, developed at the Grand Junction plant of Uranium Processes.

Baggs Uranium Corp. reports that it has a total of 102 mining claims in mineralized areas that show strong radioactivity. Claims are the Olds group near Powder Wash, Moffat County. Twenty-two claims known as the Olds and New group are in Poison Basin area, Carbon County, Baggs, Wyoming. Wagon-hole drilling in both areas shows mineralization zones. Springs in the draws indicate a water supply.

National Uranium Co. of Idaho reports encouraging results on two of its uranium exploration ventures. At the Jarwell property southwest of Grand Junction, a point venture with Pathfinder Uranium of Salt Lake City, a clearly-defined mineral channel carrying values as high as 0.1 and 0.2% uranium oxide has been indicated by the 32 test holes completed to date. Efforts are now being made to negotiate operating agreements with the owners of adjoining claims.

C. E. Hough, business manager of National Farmers' Union, said NFU has abandoned plans for the $6-million triple superphosphate plant at Canon City, Colo., which was under consideration last summer.

However, "we definitely will start development before the end of this year of our northeast Utah phosphate rock deposits."

By development this year, he said, he meant that mining of the deposits would be started and construction would begin on a processing plant.

One of the largest mining claim transactions in the history of the Gunnison area was completed when the Gunnison

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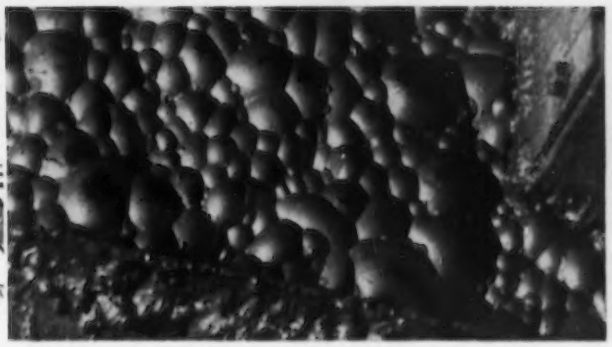

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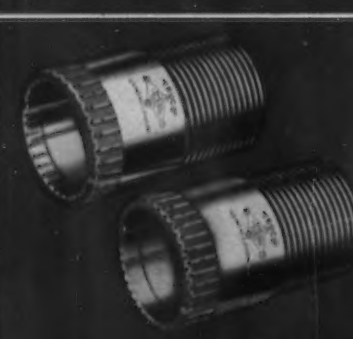
Drillers count on this Truco Bit for fast, economical footage under the roughest hole conditions. It stands up to abuse and keeps going where surface set bits might be affected by impact and abrasion from cherty, fractured and non-homogeneous formations. Fine, small diamonds, evenly distributed throughout the matrix give continuous high performance until all are used up*. Truco Impregnated Bits are set in "H" matrix and require sand-blasting during use. Bits may be run until the diamond bearing matrix is completely used. State make and size of reaming shell or core barrel when ordering.

**Available in four different series for ultimate performance in different formations.*



TRUCO CASING BITS AND SHOES

Ruggedly built and set with carefully selected diamonds properly placed in patented matrix to stand up to rough usage and insure low footage cost from surface to bed rock. Although conditions vary widely and, therefore, costs also, Truco Casing Bits will always prove notably economical. Truco Casing Shoes permit set bit and reaming shell to pass through. *Impregnated* Casing Bits and Casing Shoes are also available. All standard sizes. State make and size of your equipment when ordering Casing Bits or Shoes.

WHEEL TRUEING TOOL COMPANY

TRUCO DIAMOND DRILL BITS *by Wheel Trueing*

TRUCO REAMING SHELLS

Strip type—made to exact tolerances with strips placed in any desired positions. These shells ream accurately and hold gauge to the end of their life. Used with Truco Bits, they insure accurate hole size and eliminate subsequent reaming with bits. Can be run behind a solid bit to minimize vibration.

Ring type shells are preferred by many drillers in hard, broken formations. All sizes available. State make and size of core barrel when ordering.

STANDARD OIL FIELD BIT

In addition to all kinds of mining bits, Truco builds a complete range of oil field diamond drilling products including large bits 9" in diameter and over. The Standard Oil Field Bit, shown above, is for drilling in unknown struetures varying from soft limestone and shale to hard, dense sandstone and chert. It is used throughout the oil fields and is also useful for drilling gas wells and water wells. It is a rugged and reliable general purpose bit with a wide range of applications.

When ordering Truco Oil Field Bits always state whether hard or standard matrix is desired; the diamond quality preferred; and the size and type of core barrel being used.

PROMPT and EXPERT RESETTING SERVICE

The promptness of our resetting service enables drillers to keep bits working steadily with little time lost in servicing. Bits are ready for use most of the time and not in the process of being reset. Therefore, fewer bits are needed and less money is tied up in bits.

Diamonds are salvaged from worn bits by an exclusive process which cannot damage them. New diamonds are added and set at critical points of wear. New diamond weight is approximately the same as the quantity lost or damaged in use, and reconditioning, therefore, is simply the cost of new diamonds and resetting.

The exceptional holding qualities of Truco Patented Matrix Metal insures good salvage from Truco Bits and every usable stone is reset to its best advantage.

Before resetting bits, wear and performance data are studied, and our engineers can often make small changes to improve performance in specific applications.

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Write for illustrated catalog and price list of Truco Diamond Drilling Products

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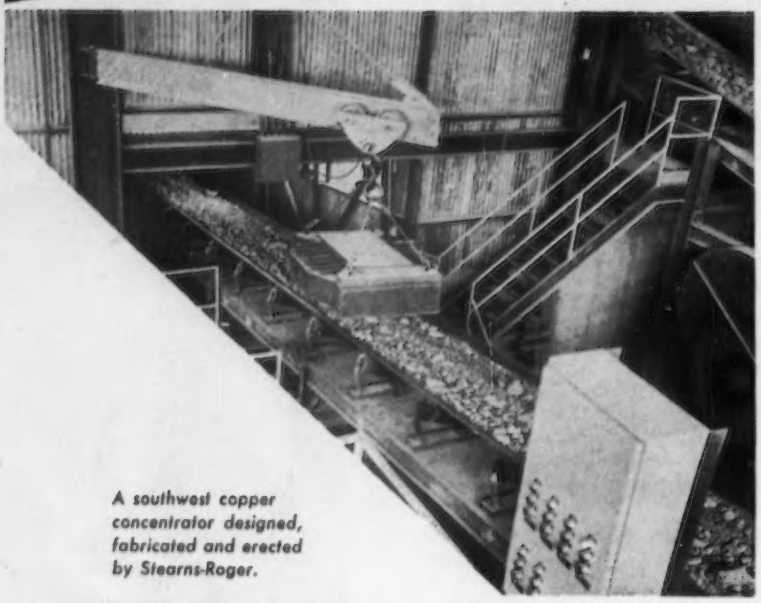
WHAT EVERY NEW PLANT NEEDS



A southwest copper concentrator designed, fabricated and erected by Stearns-Roger.

Starting with the initial plans for a new plant, sound engineering coupled with a complete design, manufacturing, and erection service insures completion of the project in the shortest possible time. Stearns-Roger has an enviable record for completion on schedule.

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STEARNS-ROGER ENGINEERING COMPANY, LTD., CALGARY

Colorado *(Continued)*

Mining Co. purchased the MAT Mining Co. claims for a figure reported to be nearly half a million dollars. Owners of the MAT, James McCullough, J. Fred Abrahamson and R. T. Thomas all of Colorado Springs, sold their interests in claims which adjoin present Thornburg property to the East. Thornburg property was discovered by the Los Ochos Mining Co.—composed of Irving Youmans and seven amateur miners from Pueblo and Colorado Springs and sold last year to Vance and Garth Thornburg for $150,000 and 15% royalty. Since that time, the Thornburg brothers have bought additional claims in the vicinity 20 miles southeast of Gunnison which had good showings of radioactivity. Gunnison Mining Co., the Thornburg-Murchison Trust —Richardson and Bass Corporation, picked up where the previous owners left off.

IDAHO

Northwest Prospecting & Development Co. of Spokane reports assays from radioactive ore from its property in Boundary County, Idaho, are mainly thorium. Samples sent to an assaying firm in Moab, Utah, show 1.56 to 17.50% thorium oxide content.

Samples from the lower tunnel on the leased Golden Sceptre property on Hall Mountain ran 13.18% thorium oxide and .049% uranium oxide. Upper tunnel assays were 3.25% thorium and .076% uranium oxide.

Bunker Hill & Sullivan Mining & Concentrating Co. has opened another ore shoot of substantial proportions in the 3,110-ft level west drift on the Alhambra fault structure at its Crescent Mine on Big Creek in the Coeur d'Alene District. Ore is tetrahedrite and chalcopyrite in siderite gangue and ranges from 6 to 8 ft wide. A strike-length of 50 ft had been opened at the time the discovery was officially announced.

This is the second ore shoot which has been found in the Alhambra structure since the shaft was deepened and exploration started at this below-sea-level horizon. The first, more than 150 ft long and averaging about 30 oz of silver per ton, was found just west of the crosscut from the shaft. Alhambra fault was the principal ore-bearing structure in the property when it was mined down to the 1,200-ft level prior to the outbreak of World War II.

Bert Sweet of Twin Falls recently announced the discovery of a promising vein of uranium on the north fork of the Big Lost River in southern Idaho. He said he made the find last fall while on a hunting trip, but kept it secret until he had received assay returns on samples sent to the atomic energy commission for analysis. They showed 4 lb uranium oxide per ton of ore, he stated. Since the initial discovery two veins have been exposed on the property and one of them has been traced on the surface for about 2 miles.

Shown being used in a narrow mine shaft, the Worden Gravity Meter is ideally suited for gravity work in hard-to-reach locations where small size and light weight are important.

Below ground you get best results with the WORDEN GRAVITY METER

Reduce mining exploration costs with the Worden Gravity Meter — world's smallest precision instrument for accurate gravity measurement. Manufactured exclusively by Houston Technical Laboratories, the lightweight Worden Meter (5⅛ lbs.) accurately pin-points gravity anomalies. Indicating variations in mass, these anomalies help delineate mineral beds, greatly reducing the amount of diamond drilling and crosscutting necessary for exploration.

Requiring no external power source, the sealed, self compensating Worden Meter has the portability vital for fast, economical mining surveys. Reading accuracy of the Worden Meter is 0.01 milligal.

Worden Gravity Meters may be leased or purchased from HTL. Write for Bulletin GM-201.

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It Pays to Know the Facts About

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What's the Big Advantage in G-B Couplings?

G-B couplings eliminate flanging, threading, welding. No special tools or skill required to install them. Result: Tremendous savings in installation time.

How Else Do They Save Money?

All G-B couplings are reclaimable. Also, with G-B couplings, every joint is a union. Makes it easy, inexpensive to take a line apart.

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Because they permit end pull up to 102,000 and misalignment up to 7%, G-B couplings absorb shock, vibration, ground motion, expansion, contraction, etc.

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Thousands and thousands of G-B couplings installed years ago on permanent lines, buried and exposed, are still giving completely satisfactory service.

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Oil, water, chemicals, gases, air, processing fluids, abrasive materials. Permanent or temporary lines, surface or buried, vacuum, suction or discharge, vertical or horizontal.

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for plain end pipe, 1¼" to 12", 1000 p.s.i.

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for grooved pipe, ¾" to 18", 1000 p.s.i.

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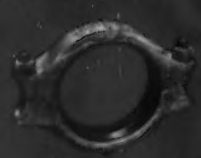

for grooved pipe, 2" to 8", 500 p.s.i.

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Get GUSTIN gb BACON Couplings

AT YOUR MINING SUPPLY STORE

Write today for brochure SS-G containing photos, specifications on all G-B coupling products, including aluminum couplings and fittings for grooved pipe.

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Idaho *(Continued)*

Sidney Mining Co. and Mascot Mines Inc. have expanded their joint venture in the uranium field by acquiring a ten-year renewable lease on a producing mine on Hatch Point just south of Cane Springs Canyon in San Juan County, Utah. 45-claim property was acquired from Colorado Uranium Mines Inc. of Moab, Utah, which had exposed a foot-thick seam of high-grade uranium ore at the base of the Chinle formation and had made an initial shipment of 85 tons of development ore considerably diluted with waste which averaged 0.358% uranium oxide.

Terms of the lease provide for payment of a royalty of 15% to the owners on ore containing 0.60% uranium oxide or less and 25% on ore containing 0.61% or more.

The two firms have dropped their Sand Flat prospect in Grand County, Utah, after initial drilling failed to prove up to expectations. They retain their interests in the Alto group in Mesa County, Colo., and in the Crawford property in Stevens County, Wash.

Silver Star Mines Inc., has optioned a 50% interest in the three-claim St. Paul property in Lincoln County, Mont., about 17 miles from Libby. Present development work is being done in the No. 3 tunnel, now in 250 ft and just entering a silver-lead-zinc ore zone exposed in the No. 2 tunnel 100 ft above.

First drill hole on the company's uranium prospect north of Monticello, Utah, penetrated "encouraging mineralization" at a depth of 70 ft together with interesting zone of radioactivity at greater depth.

Idaho Custer Mines Inc. has resumed milling operations at its Livingston property in Custer County, processing a 2,200-ton stockpile accumulated last winter under a block-leasing program. At the present time six miners are operating block leases in the mine.

Company has also completed arrangements to lease 22 uranium claims in Utah's Monticello area from Thunderbird Mining Co.

Silver Dollar Mining Co. has added another uranium prospect to its northeastern Washington holdings. Latest acquisition consists of 600 acres of deeded land and 5 adjoining mining claims in the Bisbee Mountain area of Ferry County, across the Columbia River from Kettle Falls, and adjoining another prospect which is being explored and developed by Sunset Mines Inc., also a Coeur d'Alene District firm.

Prospect, obtained under a lease contract, shows high radioactivity at the surface, officials report. Drilling exploration was scheduled to get under way about the first of August.

Company has also completed surface examination of several thousand acres which it holds in the Mount Spokane area of Spokane County, Wash., and has started bulldozer stripping in the area which shows highest radioactivity.

Uranium Holdings Inc. has sold its 75%

X-RAY DIAMOND

61,167 gauges . . . to deliver your Crane Valves 100% quality inspected

Care-how! A newly coined catch-phrase? Not at Crane! It is a rigidly-adhered-to principle of quality control—100 years old!

By way of example, the Crane technician in the photograph is checking the taper, size and guide slot alignment on gate valve discs. Every disc must correspond to the setting of the indicators—to tolerances of .001 inch plus or minus, on the taper, and .008 inch on the alignment of the slot guides. And Crane uses 61,167 gauges to insure dimensional accuracy.

Why this Care-how? To assure you of smoother, longer lasting valve operation, with lower maintenance and repair costs.

There you have the reasons why knowing and thrifty buyers prefer Crane valves . . . why industry uses more Crane valves than any other make! And the reasons why you should always buy Crane. Crane Co., General Offices, 836 S. Michigan Ave., Chicago 5, Illinois. Branches and Wholesalers serving all industrial areas.

Better Quality
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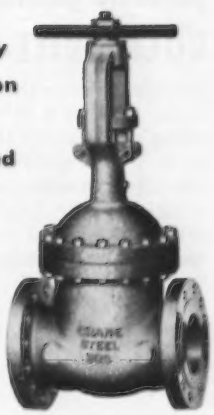
in Valves
for Every Need



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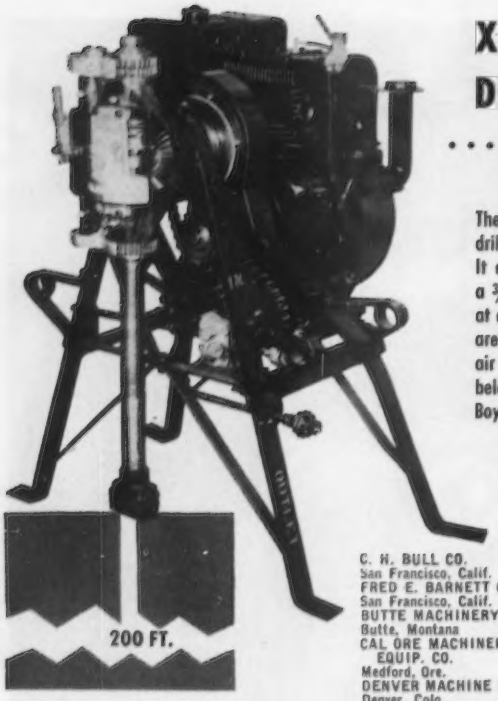

X-RAY DIAMOND DRILL

. . . drills 200 feet and takes out 3/4" Core

The X RAY Diamond Drill is the lightest drill built with a 200-foot depth capacity. It drills 1 3/16" diam. hole and recovers a 3/4" core. Drill head can be set to drill at any angle. Its gasoline and air motors are interchangeable. Very economical in air and fuel consumption and priced far below what you would expect. Built by Boyles Bros., Vancouver, Canada.

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Stanco MFGS. & SALES INC

1931 PONTIUS ST., LOS ANGELES 25, CAL.

DRILL 16 INCHES Per Minute PIONJÄR

Built-in Blower Cleans Hole As It Drills!

portable gasoline powered ROCK DRILL-BREAKER

Its floatless carburetor permits horizontal drilling — and drilling up to 45° above horizontal. Drilling depth in granite, 13 ft. Wt.: only 86 lbs. Easily carried on shoulder. By simple conversion, when used as a breaker, its terrific impact makes it equally efficient for prospectors and mine operators. It breaks through the over burden . . . and crushes rock into small, easily-carried pieces.

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1931 PONTIUS ST., LOS ANGELES 25, CAL.

Idaho *(Continued)*

interest in the Big Flat-Tucker Flat property in the Big Indian District of San Juan County, Utah, to Uranium Mines Inc., owner of the other 25% interest, for 1,192,334 shares of Uranium Mines stock. Both are well-known Wallace firms.

Metropolitan Mines Corp. has completed rehabilitation of the old main adit of the Black Bear Mine in the Burke Canyon near Gem and has started raise work to open unmined areas above old stopes. Two raises of 300 and 600 ft are planned, the shorter to be driven first. Meanwhile bulldozer work is under way, opening up the old upper tunnel to provide an opening for the longer raise and to check on reports that the face of this tunnel and the 140-ft winze sunk from it are in ore.

Metropolitan is operating the property under an agreement with Black Bear Silver-Lead Mines which holds a 12-year lease from Black Bear Mines Co.

Day Mines Inc. has opened a large new orebody in the western part of the old Hercules mine, west of any ore zone previously opened on upper levels in this area. Over 500 ft of good grade ore have been exposed in the west drift on the new 1600 level and the westerly limit of the shoot has not yet been reached. Officials describe the ore as "better than average width and grade" with some areas very rich in lead and silver values.

Exploration work is still in progress under a DMEA contract which included deepening the old Hercules shaft from the 1,200 to the 1,600 level.

Ore was first found in the western part of the mine about 1950 shortly after the company reopened the early-day bonanza, the main orebody of which had been worked out many years ago. A west drift on the 1,000 level opened several hundred feet of good ore which has since been developed by raises and winze from the 1,300 to the 600 level. Shaft-sinking was undertaken to get underneath the orebody, and while the downward extension did not prove up to expectations in this area, the new orebody was found farther west.

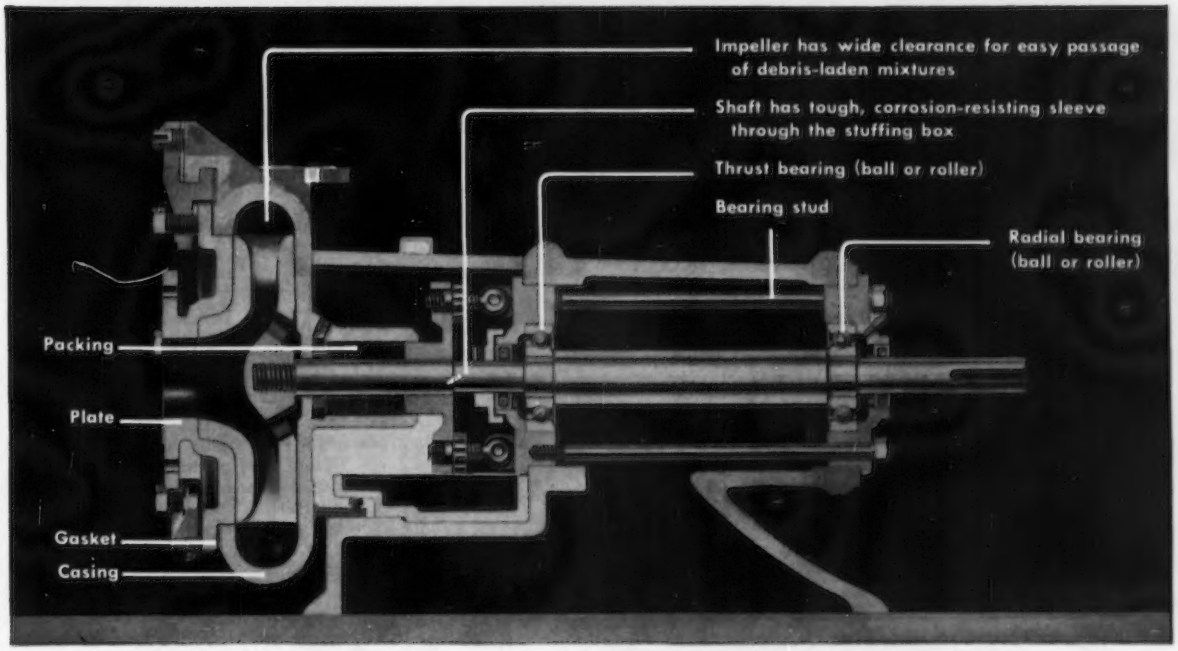
Dead Horse Point joint-venture uranium project which Nabob Silver-Lead Co., Merger Mines Corp., and Bismark Mining Co. are carrying out along the Colorado River near Moab, Utah, is fast developing into a producing mine.

First raise driven from an exploration tunnel underneath an ore zone indicated by drilling has reached the bottom of the ore channel. First assays showed 0.33 and 0.73% uranium oxide. Development ore is now being stockpiled for shipment under a preliminary 300-ton purchase contract with the Atomic Energy Commission.

An interesting feature about the development is the fact that the exploration tunnel, below the uranium ore channel, has opened a full-face of copper mineralization which does not carry any uranium values. Whether or not the copper is commercial in grade and quantity has not been determined.

AMSCO® PUMPS

job-rated for grueling service



Compact design of Amsco Mining Pumps is shown here. There are only 3 parts (casing, impeller and end plate) exposed to the grinding flow of abrasive or erosive materials.

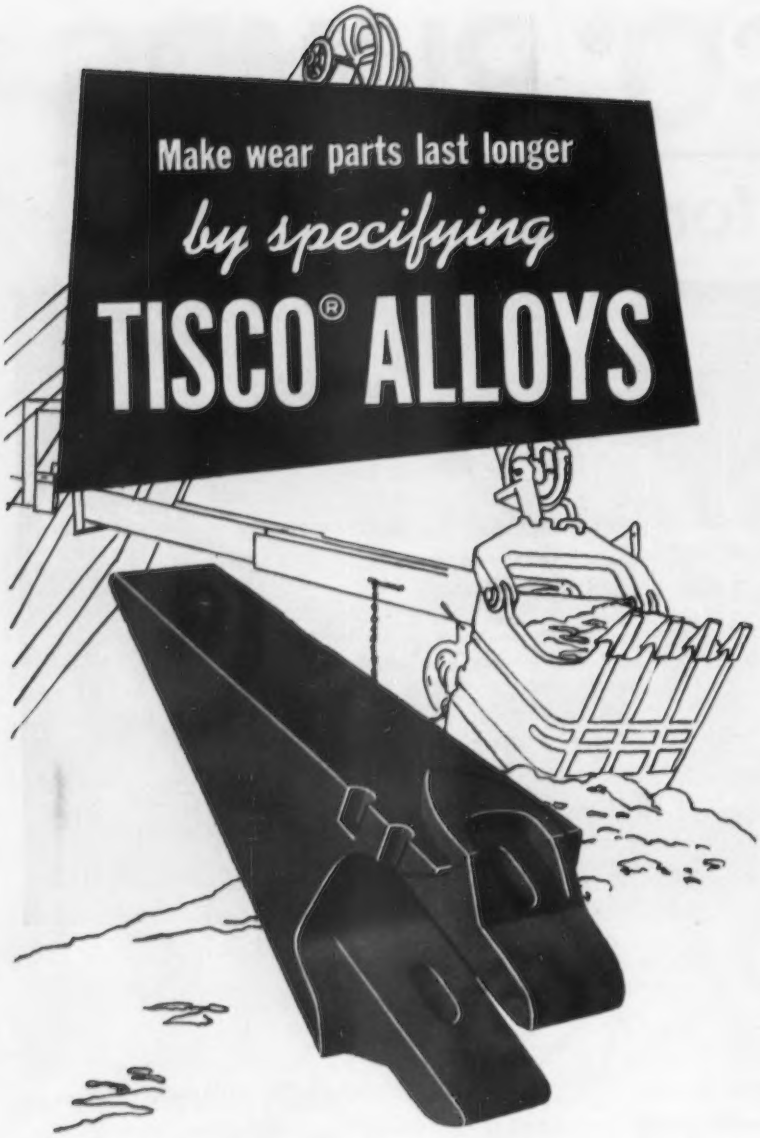
Amsco pumps stay on the job longer because they're designed especially to handle pump punishing materials such as abrasives or heavy solids.

Special wear-resistant metals are used in Amsco pump parts so they will stand up longer in abusive service. And, when repairs are needed, you'll save on labor costs because Amsco pumps are compactly designed. It takes fewer man-hours to disassemble and assemble Amsco pumps because of their simple design.

An Amsco pump specialist, with experience gained in many different installations, can help you analyze your operation and recommend the type of Amsco pump best suited for your application. Standard size Amsco pumps range from 6″ to 16″ discharge openings. Larger sizes are also available. Write for Bulletin No. 548IP which gives specifications and complete data on the Amsco pump line. Amsco also manufactures a complete line of hardfacing welding equipment... both rods and machines.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.



For almost seven decades Taylor-Wharton has specialized in research, development and production of wear-resistant alloys. Tisco Manganese Steel has become widely known in the mining and stone products industries for wear parts of power shovels, jaw crushers and other heavy duty equipment subjected to wear in a combination of impact and abrasion. It is still unsurpassed under such conditions.

More recently, too, Taylor-Wharton has developed other alloys for special purposes. Among these is Tisco 150-Y, a high chrome cast iron, capable of heat treatment up to 700 Brinell with strong resistance to severe abrasion, where impact is not a factor. Another useful alloy is Tisco 23-Y, a medium manganese chrome molybdenum alloy that can be hardened by heat treatment to 300-500 Brinell. It has excellent abrasion resistance with fair impact qualities.

These and other Tisco Alloys are at your service to lower maintenance costs. Ask us about them.

TAYLOR-WHARTON Iron & Steel Co.

(Division of Harrisburg Steel Corporation)

HIGH BRIDGE 1, NEW JERSEY

Use TIMANG Weld Rods and Shapes for rebuilding and repairing worn parts made of manganese steel.

Birmingham, Ala. Cincinnati, O. Easton, Pa.

Idaho *(Continued)*

Montana Standard Mining Co. is trucking a 1,200-ton stockpile of ore mined last winter at its Prospect creek property east of Burke to the Golconda mill near Wallace. Ore is being brought over the difficult Glidden pass route at the rate of about four truckloads a day, and officials say it will take until snowfall to get all of it to the mill.

Reopening of the old property was started in 1953 and since then the company has spent $36,000 getting it into production. Last year 450 tons of ore were shipped, grossing $16,000 after payment of milling and smelting charges.

Present plans are to mine enough from above the adit level to finance deeper development and construction of a mill.

Development of the property was started back in 1902 and although a substantial amount of underground work was done and some direct smelter shipments made, lack of milling facilities handicapped the operation and it lay idle for many year, until 1953.

ILL.-KY.

Purchase of the Victory Fluorspar Co., one of the richest properties in the Southern Illinois fluorspar mining district, by Minerva Oil Co. from A. H. Stacey and Sons, is announced by Gil Montgomery, Minerva general manager. Transaction embraces mineral rights of 1,148 acres, all mining equipment, 438 acres of surface, and eight residences as well as the Ohio River loading-dock at Cave-in-Rock, Ill.

Property adjoins the Crystal fluorspar mine, acquired by Minerva three years ago, and will be operated as an additional ore reserve to the Crystal, supervised by Crystal management. The works will be connected underground for haulage, but pending that development two shafts will be operated. Ore will be processed through the Crystal mill.

Minerva has awarded a short-term mining and development contract to Ed Lane, former mine superintendent for Stacey and Sons.

A complete program of moderization is planned.

A new crushing installation at Minerva's No. 1 mine, north of Cave-in-Rock, which was completed a few months ago, has attracted widespread interest among mine operators. Dsicharge is to a conveyor belt, leading half a mile to a shaft storage bin.

Two hours after the Trade Agreement Extension Act was signed into law by the President on June 21, representatives of the domestic fluorspar industry filed an application, requesting limitation of fluorspar imports under Section 7 of the trade act. Date of hearing before the director of the Office of Defense Mobilization has not yet been set, pending Congressional appropriation of funds for conducting the hearing, according to Clyde Flynn, Jr., of Elizabethtown, Ill., counsel for the fluorspar producers. Most of the mines in the Ill-Ky. district have

HOW TO BUY CONVEYOR BELTS

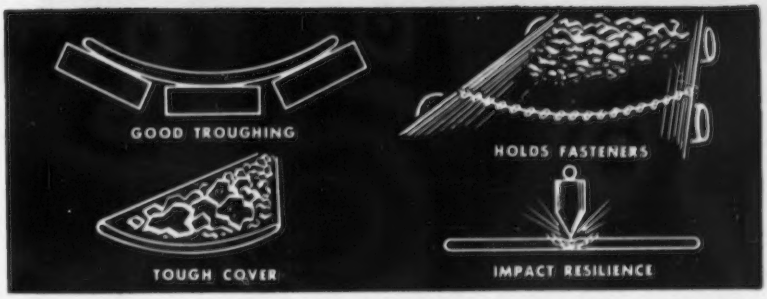
FOR FULL LOADS ON UNEVEN RUNS

...and get "More Use per Dollar"

Look for a belt with engineered features that assure maximum troughability, resistance to gouging, tearing or ripping, and dependable fastener-holding qualities.

Good troughing is the first thing to look for in an efficient, straight running conveyor belt on up and down grades. To trough properly, a belt must have full freedom and flexibility to make adequate contact with the center rollers. Conventional duck belting strong enough to handle the heaviest loads is stiff and "boardy", does not trough readily and consequently causes load spillage . . . especially where belts must follow uneven contours, as in mining operations.

Specify by name the one belt specially built to resist gouging and tearing, to trough deep and carry a full load regardless of the ups and downs of the run . . . specify Ray-Man "F" Conveyor Belts.



RAY-MAN "F" CONVEYOR BELTS

The elastic nature of special strength members and synthetic outer plies (both top and bottom) give Ray-Man "F" Conveyor Belts unusual crosswise flexibility to trough easier. It permits deep loads in narrow widths and has exceptional flexibility around small pulleys for low head-room operations. It requires no breaker strip, yet resists gouging, tearing and ripping better than other constructions and holds fasteners under severe operating conditions.

Let an R/M representative show you the advantages of Ray-Man "F" as well as other R/M feature conveyor belts . . . Homocord, with extra cushion for shock loading . . . Ray-Man Tension-Master for long lifts and high tensions. R/M heavy duty conveyor belts have the exclusive "XDC" Cover that greatly prolongs belt life with its extra protection against wear, tear, cuts and abrasion . . . gives "More Use per Dollar".

RM-501-08

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

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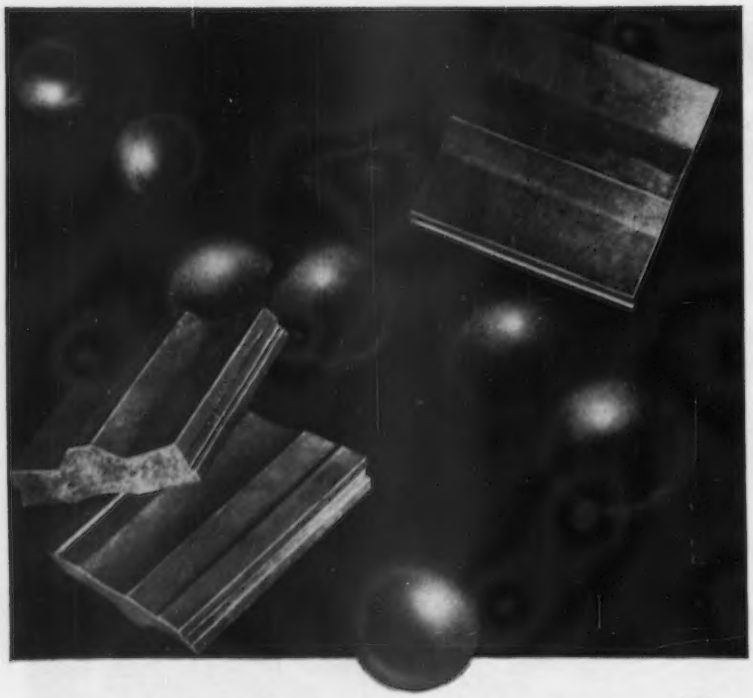
Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls



one-two punch
FOR ORE PROCESSING

Ore processors throughout the nation are fast learning that ABK Metal mill liners and ABK Metal grinding balls work together to assure longer, low-cost, dependable grinding mill operation under even the toughest of conditions.

That's because both of these products are made of ABK Metal—world renowned for its ability to give better performance in abrasive service than other materials. A Brake Shoe exclusive, these nickel-chrome iron liners and balls have a controlled martensitic structure, extreme hardness (Brinells range from 500 to 700) and unusually high resistance to abrasion.

It will pay you to contact American Brake Shoe and get full details on how ABK Metal mill liners and ABK grinding balls can help you . . . how they cut replacement, maintenance and down-time costs and, at the same time, increase the efficiency of your mill.

3419

AMERICAN Brake Shoe COMPANY

BRAKE SHOE AND CASTINGS DIVISION
230 Park Avenue, New York 17, N. Y.

Illinois *(Continued)*

been shut down in recent months. None of the mines in the Kentucky district is presently operating. In the Illinois field, Ozark-Mahoning Co., Minerva Oil Co., Aluminum Co. of America, Fluorspar Division; and Hicks Creek-Mackey and Humm Co. are operating. Some of the smaller producers are selling ore to Alcoa and Hicks Creek.

MINNESOTA

Annual report of Itasca county mine inspector, J. A. Beecroft, shows that 50 operating mines employing 3393 men shipped a total of 10,495,331 tons of ore and moved 20,772,095 cu yd of stripping in 1954. All ore shipped came from open pit mines. 1953 shipments amounted to 16,241,437 tons. There were no fatal accidents during 1954.

Minerals Beneficiation Sub-Section of the Minnesota Section of the AIME which met in Hibbing July 6 was addressed by S.E.A. Soine, in charge of ore dressing and D.J.N. Hoffman, pilot plant operator, of the South African Iron & Steel Industrial Corp., Ltd.

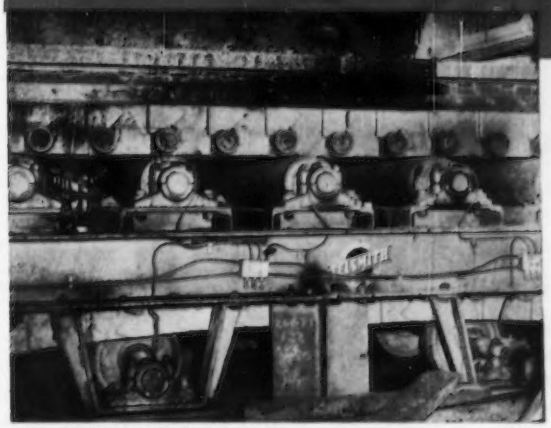
New officers were elected: John D. Boentje, Jr., general manager of Pacific Isle Mining Co., chairman, to succeed Earl C. Herkenhoff, metallurgist with Pickands, Mather & Co.; Richard W. Livingston, ore dressing engineer for Jones & Laughlin Steel Corp. at Calumet was elected vice-chairman to succeed Mr. Boentje; and Chelsea R. Phillips, sales engineer with Hewitt-Robbins, Inc., as secretary-treasurer.

Morton mine at Hibbing of the M. A. Hanna Co. was the heaviest mover of stripping on the Mesabi range in 1954. Out of a total of 65,301,121 cu yd handled during the year, the Morton accounted for 5,924,174. Of seven properties which moved more than 2-million yards each during 1954 the Sherman group, the King, the Monroe group and the Canton are Oliver Iron Mining Division operations; two—Tioga No. 2 and Embarrass—are operated by Pickands, Mather & Co.; and the Morton, which shipped its first open pit ore in 1954, by the M. A. Hanna Co.

Total iron ore shipments from the Lake Superior area up to July 1 were 27,959,012 tons: almost 6-million tons ahead of the corresponding date last year. Rate of shipments established so far in 1955 would indicate a total of 80- to 85-million tons for the full season. Because shipments over the D.M.&I.R. railroad (U. S. Steel subsidiary) are divided—approximately equally between Duluth and Two Harbors docks, the Great Northern docks at Allouez, Wis. lead in tonnage handled with nearly 10-million tons up to July 1.

Dragline-conveyor stripping operations at M. A. Hanna Co.'s Morton mine have been conducted on a 21-shift per week basis. Ore loading at Hanna's Mississippi group and several of its Cayuna range mines has been carried on 20 shifts

TELSMITH®
more economical feeders



CLEVELAND-CLIFFS IRON CO., Negaunee, Michigan has a 48-inch wide x 14-foot long Telsmith Heavy-Duty Apron Feeder with manganese steel flights, feeding a 25 x 36 Telsmith Roller Bearing Jaw Crusher. Capacity is about 3000 tons per day.

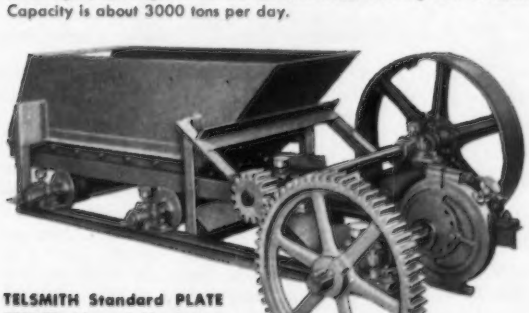
● Keep your conveyors, screens and crushers working smoothly and at full capacity. Telsmith Apron or Plate Feeders insure steady, uniformly regulated flow of material to entire plant—boost your output and cut cost of up-keep.

APRON FEEDERS are self-contained units on heavy structural steel frames. **Heavy-Duty Apron Feeders**—with carbon, or manganese steel flights—handle the toughest jobs, such as feeding primary crushers, either jaw or gyratory. **Standard-Duty Apron Feeders**—equally sturdy, but weigh less. Apron Feeders are made in 24-in. to 72-in. widths, with capacities from 25 to 800 tons per hour. Furnished with heavy steel hoppers, at extra cost.

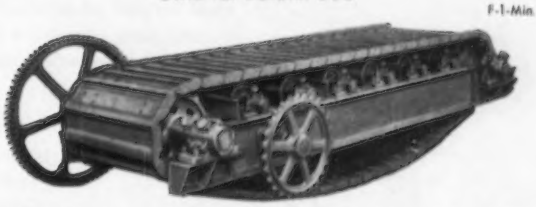
PLATE FEEDERS are simple in design—sturdy in construction. Adjustable stroke regulates capacity. Made in both Standard and Heavy-Duty models; widths 16-in. to 60-in.; capacities 12 to 740 cu. yds. per hr.

Send for Bulletin 266

F-1-Min



TELSMITH Standard PLATE FEEDER with special back gear shaft and drive pulley equipment at extra cost.



TELSMITH Standard-Duty APRON FEEDER—Raised edges of its ⅜-in. steel flights prevent spillage.

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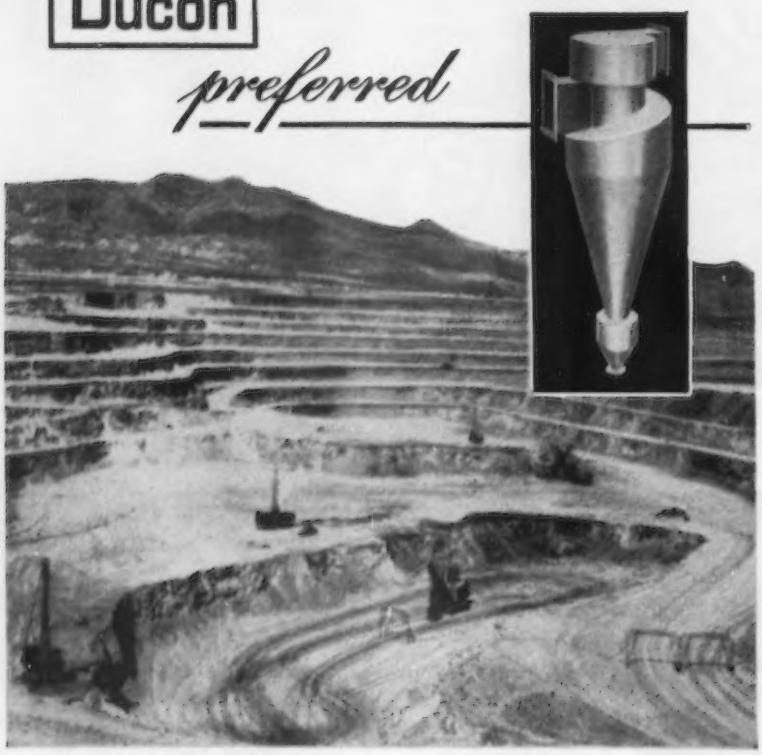

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Anaconda's Yerington Mine Operations

Ducon Cyclone Collectors are used for dust control on the various operations at Anaconda's Yerington, Nevada Copper Leaching Plant. Crushing and related operations are the starting point in the preparation of many raw materials for subsequent use, whether it be for metallurgical, chemicals or construction. From exploratory drilling through the various processes to the end product, Ducon Dust Control Equipment performs the vital service of product recovery and dust control in the many material processing operations.

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Minnesota *(Continued)*

per week with most other of their mines operating 10 or 15 shifts per week on ore.

Rhude & Fryberger resume shipments from their Pennington mine on the Cuyuna range during the last week of June. In 1954 the mine shipped 55,709 tons against 270,456 tons in 1953.

J. H. Bacon of Duluth reports the discovery of a well defined body of mica near Crane lake on the Minnesota-Ontario border. Exploration will be begun to determine whether the find warrants development.

Inland Steel Co. has leased the mineral rights on 2500 acres of land in Ashland county, Wisconsin, from the Edward Hines Lumber Co. of Chicago. The lease is for fifty years. A portion of the leased land is in Gordon, Wisconsin. The lease, dated June 23, 1955, provides that exploration work must begin within six months and must continue for two years.

Iron Range Resources & Rehabilitation Commission has authorized a geophysical and magnetic exploration survey of the iron range area. It is hoped to locate extensions of the iron formation in the Eveleth and other areas.

Churn drill is working 11 miles south of Littlefork, Minn., to determine the depth of the high radiation surface samples taken at that point. North American Uranium Mining Co. of Hibbing expect to drill to a depth of 250 ft.

E. W. Coons Co. has resumed operations at its Commodore mine at Franklin Village, Virginia. The mine showed no production in 1951 and 1952, shipped only 1126 tons in 1953 and was idle in 1954. One of the Mesabi range's oldest mines, it was opened up by the Corrigan, McKinney Steel Co. in 1893 and operated by them until 1935 when Republic Steel Corp. took over its properties. Republic operated the Commodore for two years and in 1940 it went to the E. W. Coons Co. Estimated tonnage as of May 1, 1955, was 23,874 tons. Cleanup tonnages usually exceed estimates.

MONTANA

Silver Star Mines, Inc. has taken a one-half interest in the three-claim St. Paul group, Lincoln County, about 17 miles from Libby. Group adjoins the old Snowshoe property, which has been operated to a depth of 1500 ft. The St. Paul group is said to have showings of substantial values in lead, zinc and silver.

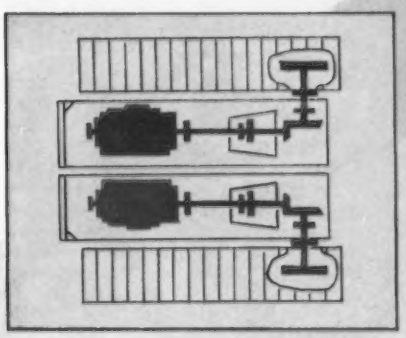
Eric Vincent and Clay Lewis are getting ready to install a dredge to mine for gold on the Christensen property on Quartz Creek, Mineral County.

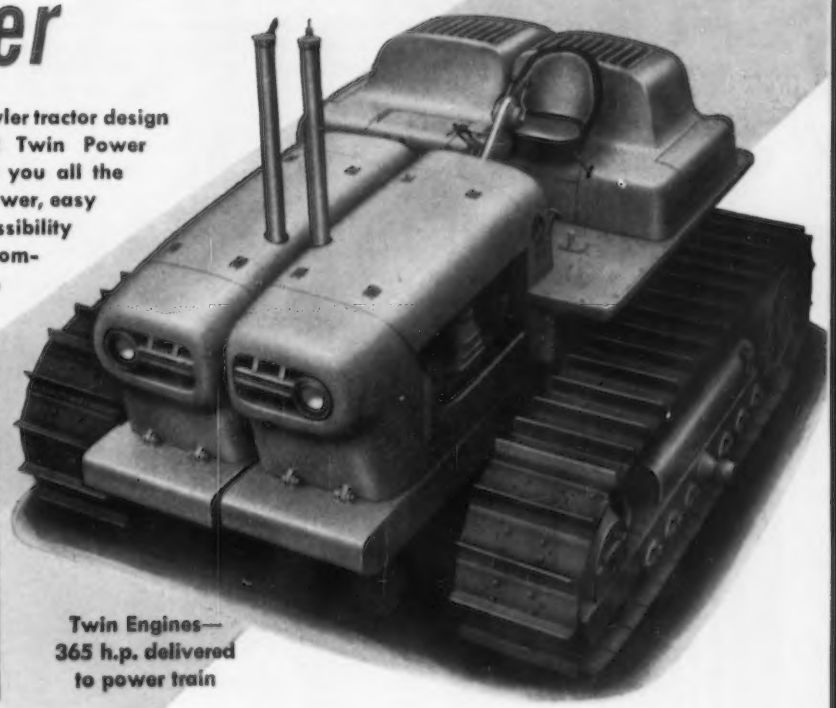
A new geologic map of Montana has been compiled and published by the U. S. Geological Survey in cooperation

Biggest Tractor News in Years...

the "Euc" TC-12 Twin Crawler

Here's a completely new concept of crawler tractor design and performance . . . the new TC-12 Twin Power Euclid. It's designed and built to give you all the features you want in a tractor—more power, easy operation, greater workability and accessibility for servicing . . . and all power train components are matched, with years of application in earth moving equipment.





Twin Engines—365 h.p. delivered to power train

SPECIFICATIONS

total h.p.—388 h.p. at rated speed	
available for tractive effort—365 h.p.	
speeds—3 speed ranges forward and reverse to 8.3 mph	
drawbar pull (bare tractor)— forward and reverse	54,000 lbs. low range 53,500 lbs. intermediate 53,000 lbs. high range
track width (standard shoe)	26"
track gauge	110"
overall width	11' 4"
overall length	16' 2"
height (excluding stacks)	7' 11"
drawbar height	23"
ground clearance	20"
operating weight (bare)	approx. 58,000 lbs.

Powered by two diesels with separate Torqmatic Drives for each track, the TC-12 has 365 h.p. available for tractive effort—a smooth steady flow of power to meet any job requirement. There's no master clutch and no manual gear shifting . . . the operator simply moves a lever to select one of three speed ranges—forward and reverse—for travel speeds up to 8.3 m.p.h. Maximum drawbar pull is equal to, or greater than, the weight of the tractor and any attachments.

Each half of the tractor is separate and free to oscillate on a single transverse shaft. This gives the TC-12 maximum stability and traction on rough ground. The tractor can be easily separated into two halves for shipment when necessary.

Never before so much workability!

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

Montana *(Continued)*

with the Montana Bureau of Mines and Geology, according to announcement by Interior Secretary Douglas McKay.

MICHIGAN

Zontelli Brothers are shipping 51 cars, or 3,570 tons, of iron ore per week from the old Davidson pit at Commonwealth, Wis., near Florence. Ore is hauled by truck to the Florence depot where it is loaded into 70-ton ore cars. About 15 men are employed. In 1953 Zontelli Brothers shipped 40,134 tons from the property.

Chicago & North Western R. R. docks at Escanaba handled 887,254 tons in June 1955: nearly double the amount docked in 1954. 81 boats were loaded during the month.
The Marquette docks, with 908,157 tons, established a new single month's record for that port.

Two young miners were injured at an Iron River mine while moving a tugger. Loosening of anchor braces caused a fall of ore and timbers on the men. They were taken to the hospital for treatment, mostly for cuts and bruises and subsequently released.

Cleveland-Cliffs Iron Co. has begun work on an agglomerating plant which will be located at Eagle Mills, east of Negaunee. Plant will handle ore from the company's new Republic jasper pit and is designed for a capacity of 2,000 tpd of pellets.

Sometime between Sunday evening and Monday morning, July 24 and 25, a large circular area, about 300 ft in diameter, at the southeast corner of the Spies mine forty, suddenly subsided. It dropped to a depth of 85 ft. The caved ground is at the intersection of U. S. No. 2—main east and west highway—and the Bates mine road, near Iron River.

Exact time is not known but strong odors of sulfur fumes were noticed about 9:30 Sunday evening, indicating that, at least, some deep cracks may have appeared then. The air shaft had been sealed with concrete some time ago. When the area dropped down the compression of air in the mine broke the concrete cap. Mine workings where the caving occurred were described as stope No. 7.

Mine officials, safety engineer and county mine inspector were notified promptly and the necessary safety measures were taken.

Spies mine stope cave-in increased the water at Inland Steel's Sherwood mine, adjoining the Spies, and production there was temporarily suspended on July 27 until pumping conditions returned to normal, or were definitely under control.

NEVADA

Shipment of 100 tons of uranium ore was made early in July from the Cornelia C. mine near Halleluja in Washoe County, and brought a return of $6,000 from the smelter and $6,000 in bonus money. Owners of the mine are Cliff Weyrick, T. R. Deavaga, H. F. Baker and Russell Barker, all of Sparks; H. W. Meadows, of Redding, Calif., and Merritt Crane, of Reno. Shipment was made to Grand Junction, Colo., and assayed 0.8%. Continuous operation is in progress at the mine and more ore is being stockpiled daily.

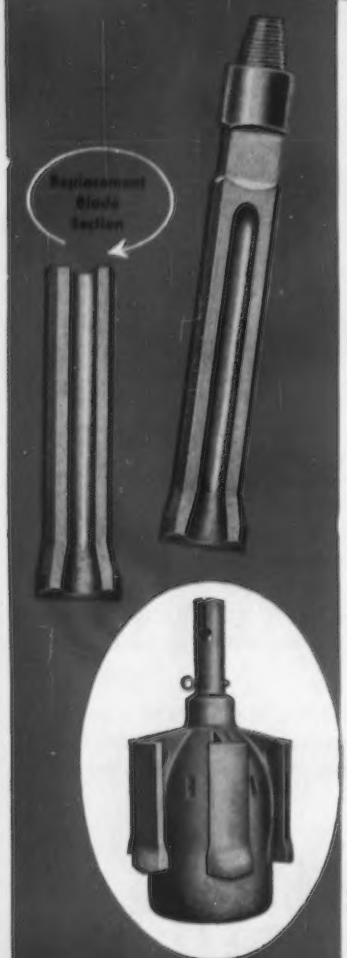
R. D. Luce, William Gibson and John Parker, all of Puente, Calif., are developing a number of turquoise claims near Candelaria with good results. The property lies to the north and west of Columbus Flat which has long been an outstanding area for turquoise production.

Uranium Mines of Nevada has opened its offices in Austin, and Stan Maestretti is doing stripping operations in Veach Canyon for the company. Sherd Baker, in charge of the firm's Lander County operations, has been busy making an extensive survey of claims in the Rundberg section and on other ground held by the Fred Volmer interests.

SPANG

BLAST HOLE BITS

Drill More Holes Per Bit, At Less Cost Per Hole



SPANG CHURN DRILL BITS, famous for long life and economy in the drilling of blast holes for the fragmentation of minerals or overburden, drill *more-holes-per-bit* at *less-cost-per-hole,* because they are fully heat-treated from end to end and have the *extra strength in pin and blade sections* to stand up under the toughest drilling conditions. They are made with semi-dressed ends for quicker, easier finish-dressing, in High Carbon, A.I.S.I. 4340, and Spang Molloy Steel.

Available also, as an added economy, are SPANG REPLACEMENT BLADE SECTIONS in the same grades of steel, and uniform forge section, for welding to pin and collar sections of original bits when long service has worn the integral blade to a point where replacement is desirable.

Anyway you look at it, SPANG BITS are your best buy for more holes at less cost per hole.

SPANG REAMER TYPE PILOT BITS FOR DRILLING LARGE DIAMETER HOLES

Can be supplied in all sizes and in any practical weight.

For information on SPANG BITS, and FREE CATALOG of Complete Line of SPANG Cable System Drilling and Fishing Tools, consult your nearest Dealer, or write direct to:

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World Record

Boulder Crusher AR-180

Six of these huge crushers are being supplied for use underground in Swedish iron mines at Kiruna and Malmberget.

The AR-180 with its 71" x 55" feed opening is the largest single-toggle type Jaw Crusher in the world. It can accept blocks of iron ore up to 10 tons and reduce these to 16" thickness. It can be dismantled into component parts suitable for transportation and erection underground.

Built in three sizes

TYPE	FEED OPENING	SETTING	MIN. MINE SHAFT DIMENSIONS	NETT WEIGHT
AR–120	47" × 35"	12"	36" × 73"	81500 lbs
AR–150	59" × 47"	12"	57" × 89"	170000 lbs
AR–180	71" × 55"	16"	60" × 98"	256000 lbs

Single-toggle design — simple and strong.
Frame in sections, with interlocked bolted joints.
Side frames for the AR-180 and AR-150 are of heavy steel plate.
SKF spherical roller bearings — grease lubricated throughout — avoiding oil leakage. Low idling power consumption.

MORGÅRDSHAMMAR

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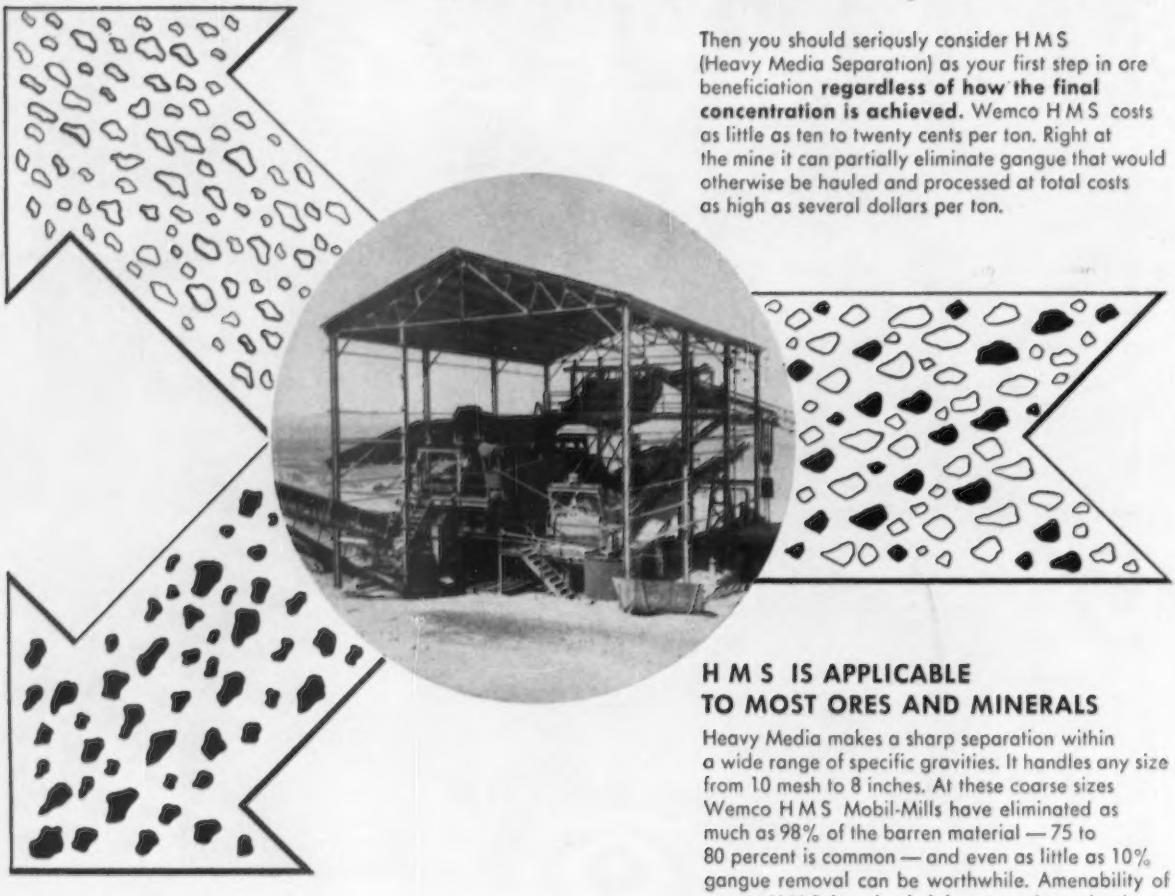
WOULD YOU SPEND 15¢ to save dollars per ton?



Then you should seriously consider H M S (Heavy Media Separation) as your first step in ore beneficiation **regardless of how the final concentration is achieved.** Wemco H M S costs as little as ten to twenty cents per ton. Right at the mine it can partially eliminate gangue that would otherwise be hauled and processed at total costs as high as several dollars per ton.

H M S IS APPLICABLE TO MOST ORES AND MINERALS

Heavy Media makes a sharp separation within a wide range of specific gravities. It handles any size from 10 mesh to 8 inches. At these coarse sizes Wemco H M S Mobil-Mills have eliminated as much as 98% of the barren material — 75 to 80 percent is common — and even as little as 10% gangue removal can be worthwhile. Amenability of ores to H M S is a simple laboratory determination. Wemco offers this service.

WEMCO'S H M S MOBIL-MILL IS A PROVEN COST SAVER

The Wemco Mobil-Mill is H M S in its most practical form. The cost is predetermined and low because it is a complete plant that is pre-engineered and pre-fabricated. It can be assembled close to the mine (or even underground). And, the Wemco Mobil-Mill is so thoroughly proven in design that it operates from the first day. Mobil-Mills are available to fit your problem exactly. Capacities range from 5 to 500 tons per hour.

Wemco has built over 50% of all the H M S plants in use today. This experience can help you. Wemco welcomes your inquiry.

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Nevada *(Continued)*

Sam Hain and Pat Sweeney are driving a 200-ft tunnel at their mine in lower Tule canyon in Esmeralda County. Property is a gold producer, and the two operators plan on a continued development and production program.

Construction of a road over Mill Creek summit to the Gray Stone barium mine near Battle Mountain was completed during July. The ore is now being trucked over the route from the mine to the site of the Magnet Cove mill which is rapidly nearing completion at Battle Mountain. Ore is being stockpiled until the mill operations begin. Wells Cargo Inc. furnished the road building equipment and the operation was done by Mel Barkdull and Howard Neely, aided by the Lander County road crew which installed the culverts.

Prospects for a new titanium plant at Boulder City brightened early in July following a visit from Jesse R. Lowe, division superintendent of the Houston Natural Gas Co., and Daniel S. Ring, also of Houston. The two men conferred with M. G. Mastin, president of Aero Metals Corp., regarding the new plant, and gave assurance that the necessary financing has been arranged for construction to start in the "near future."

Bruhi Mill at Silver Peak in Esmeralda County began operating July 8 on a 30-day trial period, in order to make some adjustments possible. After that it was to go into full operation treating ore from the Argentite mine, which is 24 miles away at the end of an uphill road. Curtis Cline has contracted to do the hauling with two 25-ton trucks. Ed King is superintendent of the mill and E. J. Shirley is superintendent of the mine operation which is increasing its payroll from 45 to 65 men as a result of the completion of the mill.

An important new ore find has been made at the Bristol Silver Mining Co.'s Lincoln County property. Discovery was made after a drill hole was put down and a drift was run off into a new area. Ore has already filled several cars and value is reported running high. Mine is located in the Bristol-Jackrabbit district 25 miles northwest of Pioche, and is under the managership of J. H. Beuhler.

George W. Mitchell, general manager, Eureka Corporation, Ltd., Eureka County, reports that the TL Shaft has reached a depth of 1053 feet and that a station is now being cut at the 1050 foot level. Planned depth of shaft is 1125 feet. Ore is plumbojarosite with values in lead, silver and gold.

Consolidated Eureka Mining Co. plans substantial increase in lead-gold-silver shipments from its Eureka mine to Midvale, Utah, smelter, United States Smelting Refining & Mining Co.

Output rate hasn't been set, but Sherman Hinckley, general manager, Salt Lake City, says removal of cavings in one area of the mine permits the increase.

He also confirmed that Consolidated Eureka was engaged in substantial bulldozing operations in the Willow Springs area of Nye County in search for a widespread, low-grade uranium orebody. To date, only small deposits of carnotite type ore in fissure-cracks has been uncovered, he reported.

NORTH CAROLINA

New regulations governing Government purchases of hand-cobbed mica were put into effect Aug. 16 by the General Services Administration, placing price ceilings of $600 a ton for ruby mica and $540 a ton for nonruby mica, except for producers who will sign releases of any possible claims for damages against the Government. It is said that for those who will sign releases, the ceilings will become effective Sept. 15.

From Sept. 16 through Dec. 14, $1.45 per pound yield will be deducted from the ceiling as a processing charge, the GSA said: It added that the waiver of possible damages was necessary because there is such a change in prices in a purchase program that there is a chance some investors or producers may claim damages from the Government.

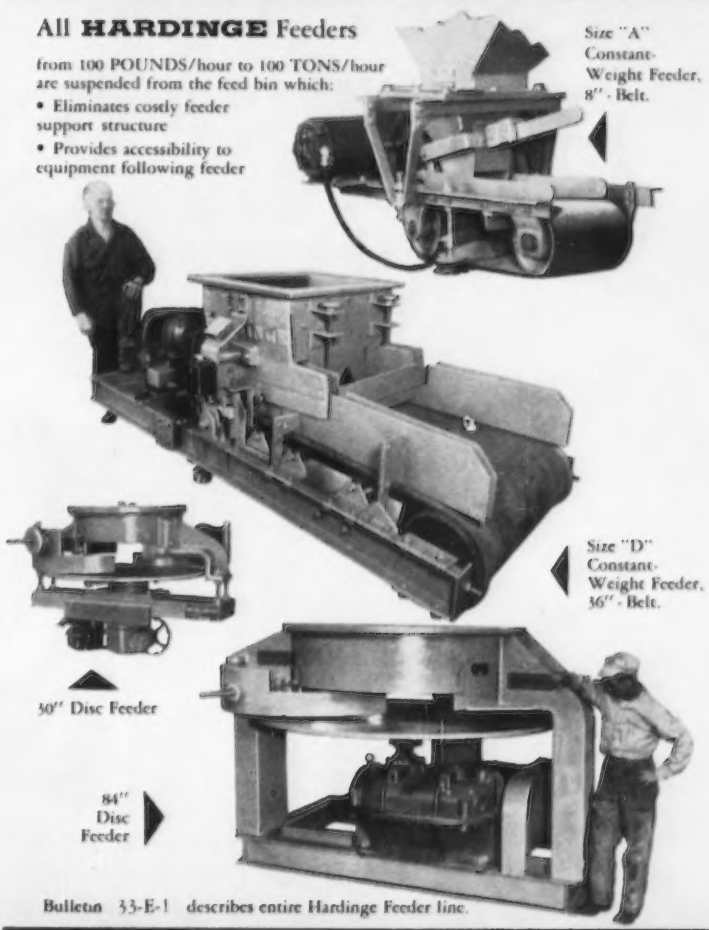
It said that a substantially higher price

LOW INSTALLED COST

All HARDINGE Feeders

from 100 POUNDS/hour to 100 TONS/hour are suspended from the feed bin which:

- Eliminates costly feeder support structure
- Provides accessibility to equipment following feeder



Bulletin 33-E-1 describes entire Hardinge Feeder line.

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extend furnace life...
increase production...
reduce operating costs...

A single basic refractory having universal application in metallurgical furnaces can only be visionary. The selection and use of the refractory best suited for each specific requirement is reality—upon which depends the most desirable results. Harbison-Walker produces no less than 12 different classes of basic brick, and in addition various basic monolithic materials and cements. These provide the particular kinds that serve best for every individual need.

Included in this complete range of commercial basic refractories are CHROMEX B, the extra hard fired chrome-magnesite brick, and H-W MAGNESITE brand, a superior high magnesia content brick having also enhanced physical properties. These continue to make splendid records in copper converters.

Cross-section of typical copper converter, showing refractory lining.

Please consult Harbison-Walker technical service.

REFRACTORIES COMPANY

World's Largest Producer of Refractories • General Offices: Pittsburgh 22, Pennsylvania

No. Car. *(Continued)*

was being paid under the program than is being permitted by the new ceilings, and that the latest report on the program showed 5,305 tons had been bought up to March 31 of an authorized goal of 25,000 tons.

Program A, applying to mica that is dug, processed and delivered to Government depots in wanted grades, is not affected by the changes.

North Carolina State Board of Conservation and Development at a meeting at Morehead City July 25-27 adopted recommendations of its Minerals Committee that state representattives confer with three firms expressing interest in the black sands of all North Carolina coastal waters except Currituck Sound, regarding proposals to investigate in areas to be designated to determine if there is sufficient ilmenite there to justify mining it in commercial quantites.

Before any permanent lease is signed, according to the recommendation, a public hearing would be held and consideration would be given to arriving at a system of royalty that would give the State the benefit of increases in the market price of the product mined.

State geologist J. L. Stuckey; director Ben E. Douglas of the conservation and development department; and Scroop W. Enloe Jr., member of the minerals committee, will represent the State in the negotiations with the companies, which are interested in prospecting leases to search for ilmenite and other minerals in the sound waters of Albemarle, Pamlico and other waters.

The would-be prospectors were listed as National Lead Corp. of New York, W. H. Rodenbeck and Associates of High Point, N. C., and Graham D. Monroe of Princeton, W. Va.

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...reliable instruments for amateur and professional prospectors, schools, industry

RCA WF-10A—Uses 1B85 Geiger-counter tube inside case. 3 counting ranges: 0-100, 0-1,000, 0-10,000 counts per minute (CPM). Has 3-way indication: meter, neon flasher, headphone. Weight, 5 lbs. with batteries. Measures 8" x 3½" x 7½". Complete.....$119.50*

RCA WF-11A—Similar to WF-10A but employs extra-sensitive 6306 bismuth-type Geiger-counter tube. 3 counting ranges: 0-200, 0-2,000, 0-20,000 counts per minute. Complete.....$154.50*

RCA WF-12A—Has 1B85 Geiger-counter tube in external probe. 3-way indication: meter, neon flasher, headphone. 3 counting ranges: 0-100, 0-1,000, 0-10,000 (CPM). Weight, 5½ lbs. with batteries. Measures 7¼" x 3½" x 7½". Complete.....$149.50*

RCA WF-14A—Similar to WF-12A but employs extra-sensitive 6306 bismuth-type Geiger-counter tube in external probe. 3 counting ranges: 0-200, 0-2,000, 0-20,000 (CPM). Complete.....$186.00*

RCA WF-15A—Similar to WF-16A but employs ten 1B85 Geiger-counter tubes. 3 counting ranges: 0-1,000, 0-10,000, 0-100,000 (CPM). Complete with leather carrying case.....$475.00*

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- Supplied with convenient shoulder strap

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OHIO

Chillicothe is site of first uranium mine in Ohio. Samples of ore from the property, owned by R. W. Mowery's O-Ky Mining Co., were assayed by University of Maryland and reported favorable. Mowery, a used-car dealer, and his partners, are hopeful.

OREGON

South American zinc ore concentrates representing the first shipment through Portland to inland smelters—principally northern Idaho—were unloaded July 20 from the Chilean-North Pacific Line's M. V. Almagro. The 2200-long-ton shipment inaugurated a cargo movement expected to grow as result of modernization of bulk dry cargo handling facilities by the Portland Commission of Public Docks. South American cargo joined similar ore concentrate shipments which began flowing through Portland from the Caribbean and Australia earlier in the year.

SOUTH DAKOTA

Bill to open rich uranium deposits in northwestern South Dakota to mining activities when a practical process of extraction is developed has been sent to President Eisenhower for signature.

The bill would release public domain lands classed as coal reserves.

Before being sent for Presidential signature, the bill was amended on request of the Department of Interior. The amendment limits the act to 20 years, extendable to 30 years by presidential proclamation.

Northwest corner of South Dakota possesses large quantities of uranium shale. The shale does not process by the same methods as ores obtained at Edgemont, S. D.

South Dakota School of Mines has asked AEC for a contract to conduct research on a method of utilizing the shale commercially.

F. L. Partlo, president of South Dakota School of Mines and Technology, said he is certain a process can be found. He and Sen. Case (R-SD) are asking AEC for a contract.

Preliminary investigations have indicated a high percentage of uranium in

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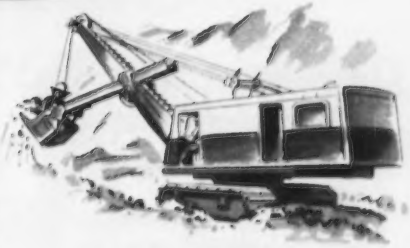

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So. Dak. *(Continued)*

shale found in the northwest area.

Partlo said, "It is necessary to process the shale and concentrate the uranium before it is of commercial value. Surveys have been made of the deposits under the direction of the AEC and from reports I have seen it would look as if reserves are considerable and would warrant commercial treatment."

NEW MEXICO

Kerr-McGee Oil Co. expected to begin work in September on its first shaft at its potash operation east of Carlsbad. The 15-ft shaft is to be sunk 1,600 ft, and the company hopes to have enough ore on the surface by September, 1956 to keep a refinery in operation.

Southwest Potash Corp., wholly owned subsidiary of American Metal Co., Ltd., has undertaken the first major expansion of its potash mine and mill at Carlsbad, New Mexico, since it began operations in late 1952. Its capacity will now be increased by one-third at an estimated cost of $2,500,000. New production will be ready about February, 1956. Installations are such that further expansion can readily be accomplished as market conditions justify.

UTAH

Lisbon Uranium Co. reports that 40% of the 190 core holes drilled on firm's properties in Big Indian District, San Juan County, Utah, are in "mineable, commercial ore."

A. P. Kibbe, president, told a recent special stockholders meeting that chemical assays provided by Moab Drilling Co., the Charles A. Steen partnership which conducted exploration, also showed some extraordinary high values in three holes.

Kibbe said that these holes were "not normal" and that two holes were on related bodies and one hole, unrelated.

Drilling includes portions of the newly-acquired Barett claim for which Lisbon is obligated to pay $3-million.

Lisbon is 66 2/3 controlled by affiliates of financier Floyd B. Odlum's Atlas Corp.

The special meeting to consider merger with Gateway Mining Co., Grand Junction, Colo., was adjourned on account of legal technicalities.

Stockholders of Cherokee Uranium Co. of Utah have voted to merge with Ventures, Inc., a privately-held company of Grand Junction, Colo.

A previously issued injunction restraining the merger was dissolved by Third District Court Judge Clarence E. Baker of Salt Lake City.

Surviving firm will be known as Beaver Mesa Uranium Corp. operating properties on Beaver Mesa in Utah and Colorado.

Ten shares of Cherokee will be exchanged for one of Beaver while 153

shares of Beaver will be exchanged for one of Ventures.

Western Development Co, Santa Fe, N.M., oil, gas and nonferrous metals firm, has acquired 100% of the outstanding securities of Excalibur Uranium Co. with properties and mines in the Green River area of Utah and elsewhere on the Colorado Plateau.

Robert E. Dwyer, president of Anaconda Co., believes that so long as there is any danger whatsoever of war, uranium mining and processing will remain under Government control.

He told *E&MJ* correspondent at Salt Lake City, however, that rapid progress in reactor development had now made production of electricity from the atom commercially feasible in countries where oil and coal supplies were limited.

He is optimistic that the "gap" between power generation from fossil fuels and the atom will be narrowed appreciable in the near future as result of private reseach contributions.

He foresees no effective reduction of copper demand as result of aluminum competition in years ahead. Rather, he said, it is case of demand for both metals rising with increased economic activity in United States.

Dwyer was in Salt Lake City on visit of International Smelting & Refining Co. properties and guest of F.A. Wardlaw Jr., IS&R general manager.

Royal Uranium Corp. has reached agreement with the Atomic Energy Commission for shipment of 1,200 tons monthly of ore from the firm's Indian Creek District, San Juan County.

George H. Patterson, Royal president, said the ore would be shipped to the ABC's Monticello, Utah mill.

Royal has stockpiled 3,000 tons of uranium ore at the mine adit which on the average, had been chemically assayed at around 0.34% U_3O_8. Efforts are being made to blend the ore downward in interest of economy and profit.

Apache Prospecting Permits

SALE of uranium prospecting permits on two units of Fort Apache Indian Reservation brought more than $43,000 into tribal coffers, says John O. Crow, agency superintendent. As a result of interest shown in the June sale, it is expected that additional tribal lands on the Fort Apache reservation and the adjoining San Carlos reservation may be offered.

Charles Redd, Utah rancher and industrialist, has joined with M.K. Ruddock, Denver and Moab, in programming construction of a modern mining camp at La Sal, eastern San Juan County, Utah.

The area will be developed for water, electricity and sanitation in serving trailers owned by miners working in the Big Indian and Indian Creek and other districts of northern San Juan County, Ruddock said. Such a camp would cut travel time from Moab and Monticello to the mines by a considerable time.

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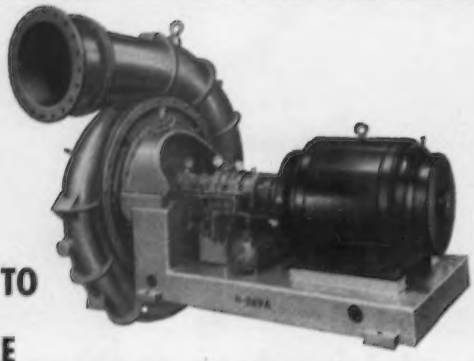

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Utah *(Continued)*

newly organized Uranium Reduction have been named by R. A. Young, St. Louis, executive vice president.

They include: Roy Hollis, named general manager of the new $8-million uranium mill the firm is building at Moab. Hollis has been manager of the National Lead Co.'s Grand Junction, Colo., office. In this capacity, he directed the construction and operation of the AEC's large mill there.

"Hollis has been instrumental in developing a great many of the modern techniques of uranium milling and is considered one of the country's leading authorities in this field," Young said.

J. W. Burgess, a former employee of an American Zinc, Lead and Smelting Co. affiliate at Dallas, Tex., was appointed general manager of construction of the mill. He will reside at Salt Lake City.

Sid Worthen, Salt Lake City, project engineer for Combined Metals Reduction Co., will be project engineer at Moab under Burgess.

E. H. Snyder, Jr., metallurgist for Combined Metals, was named process engineer under Mr. Hollis at Moab.

Dan Stewart, Joplin, Mo., was appointed chief geologist in charge of the Big Indian venture. This is a joint mining program on seven claims by Uranium Reduction and Standard Uranium Corp. Stewart formerly was geologist at Joplin for American Zinc, Lead.

Chief financial officer of Uranium Reduction Co. will be J. W. Losse, St. Louis, Mo. As controller for URC he will make offices in the new First Security Building in Salt Lake City.

Other appointments for the uranium mining and milling firm included: Clem Chase, formally with Utex Exploration at Moab and U.S. Vanadium Corp. named metallurgist, and Ben Coomes, St. Louis, former American Zinc employe, named project auditor at the Moab headquarters office.

American Smelting & Refining Co. announces that core hold drilling on magnetic anomalies on and near the Utah State Point of the Mountain Prison 23 miles south of here had not encountered any mineralization of economic interest.

Company's western exploration department has returned leases on the property to the state.

Radon shaft being sunk by Hecla Mining Co. in a joint venture with Utah & Idaho, now a part of Federal Uranium Corp., was expected to be in ore by early September.

The shaft, to be bottomed at between 650-700 ft, will tap an ore body now estimated at $30-million.

Daniels Construction Co., Albuquerque, has begun work on the Rattlesnake mine of Continental Uranium, Inc., which is being developed as an open pit.

Contract calls for moving 2.5-million yards of earth and rock from an area 600 by 450 ft. Completion date is March 1956. Cost of the job is estimated at $750,000.

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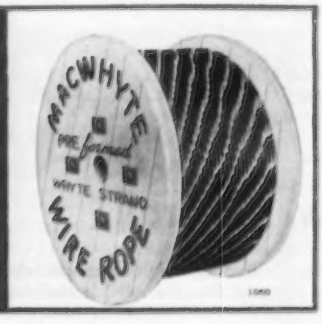

Utah *(Continued)*

Amuranium Corp. reported to stockholders in July that an 8,000-ton orebody has been blocked out on its Brown's Hole property, San Juan County, now said to be producing about 30 tpd.

Amuranium also said production has been increased at its Red Bluff strip mine near Grants, N.M., to 50 tpd.

North Standard Mining Co. early in July bought all assets of Clyde Uranium Mines including the Lark Leighton mine in Bull Canon, Montrose County, Colo., in a deal involving $65,000 in cash and stock.

George J. Sullivan, North Standard president, said prodution would be increased to 130 tons weekly.

Clyde Bellows, who organized Clyde Uranium, has joined the North Standard staff as mines manager and Dana D. Norman, superintendent for Clyde Uranium, has become chief engineer and geologist for North Standard.

Moab Mines, Inc., shipped the first load of ore from its Lucky Nine mine on Wray Mesa, Colo., in July. President William Owen also announced the company has acquired mercury and tungsten properties in Nevada and expected to begin operations there in August.

Utaco Uranium, Inc., began mining operations on its Coalbed Canyon claims early in August.

There is evidence that Delhi Oil Co. has uncovered commercially exploitable deposits of potash 7 miles north of Moab in Grand County, Utah.

Federal district land office in Salt Lake City reports that Delhi has moved to convert its potash prospect permits to potash leases. This means the firm must mine or otherwise exploit the deposit it leases. Location for two more deep wells was announced by the firm.

International Smelting & Refining Co. (Anaconda Co.) has resumed full operations at its reduction center at Tooele after a lapse of more than a year.

F. A. Wardlaw, Jr., IS&R general manager, said that zinc fuming, lead blast furnaces all were placed into production and concentrator load increased. The mill had been in partial operation.

Resumption of operations had been scheduled two months ago. But contract negotiations with International Union of Mine Mill & Smelterman delayed reopening.

Shutdown of operations here had been caused by low metal prices for lead and zinc, which reduced mine output at Darwin, Calif., and in Intermountain metals districts.

Some 500 workmen are employed at the reduction plant near Tooele.

WASHINGTON

Atomic Energy Commission officials said in Spokane that the AEC is studying the

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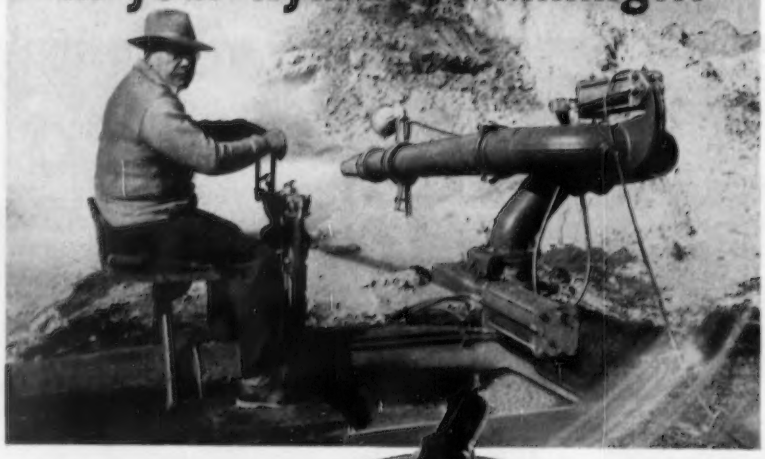

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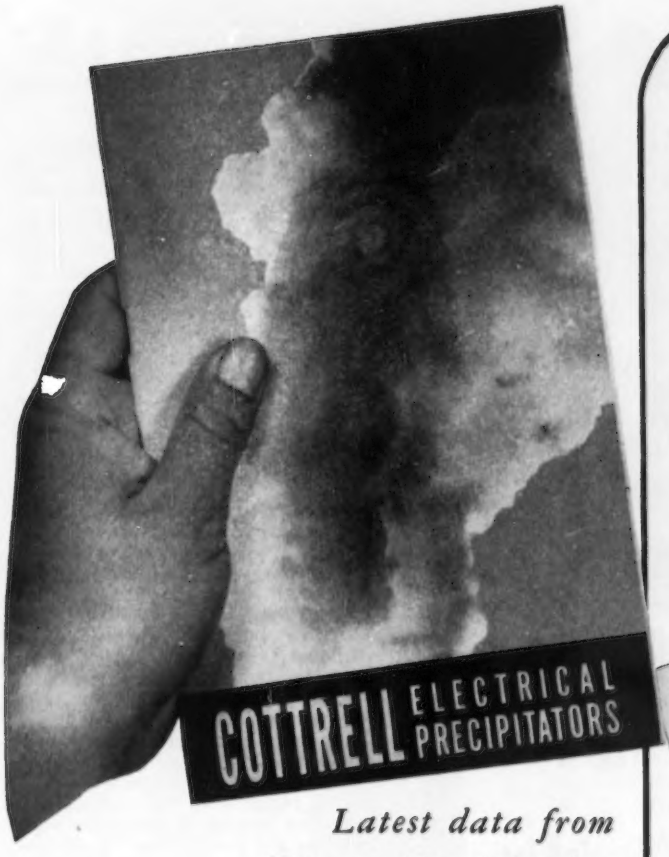

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Washington *(Continued)*

possibility of building a $100,000 uranium ore-buying station in the Spokane area. Dr. Charles Rasor, chief of the AEC's ore procurement branch, Grand Junction, Colo., says however, the AEC must be assured of about 3,000 tons of uranium ore monthly for at least three years.

Said Rasor: "It is up to private industry to prove the area. Uranium showings have to be opened to determine their extent. It takes time to prove ore reserves." He pointed out it is expensive to ship the ore to Salt Lake City, as provided under present contracts with Midnite and Daybreak Mines. He said if an ore-buying station is built in Spokane area, the AEC would stockpile purchases until supply were large enough to justify construction of a local uranium processing plant by private industry.

A three-man delegation from the Spokane Indian tribe went to Washington, D. C. July 18 to explain the tribe's stand on mineral prospecting and leasing on reservation land.

The delegates, Alex Sherwood, Clair Wynecoop and Glenn Galbraith, were instructed to uphold the tribe's stand of a year ago limiting prospecting and leasing only to tribal members, but allowing them to negotiate with reputable mining firms for assistance in prospecting and developments.

Delegates will also present a new prospecting permit form that will allow a total lease acreage of 160 acres (compared to the present limit of 40) and permit the holder to keep the lease for one year with an option to renew for a second year. Present Indian Bureau rulings limit prospecting rights to the season ending October 31.

Tungsten Uranium Mines, Inc., has resumed production of tungsten concentrate at its Germania mill in southwestern Stevens County. Mill is handling about 80 tons of ore daily, mined by open-pit method above the old main adit of the Germania Mine. Mill, shut down since winter, has been running regularly since July 5, and a two-shift schedule was planned for late in July.

Before reopening the mill, the firm had been prospecting its holdings for possible uranium ore. The Germania lies north of the Spokane Indian reservation, where Midnite Mines, Inc., is working a uranium development.

Discovery of high grade autunite float on leased land has been reported by the Painted Desert Uranium & Oil Co. Ore, obtained about one-half mile south of the Daybreak development in northern Spokane County, is similar in appearance to ores from the Daybreak site.

Consulting engineer for Continental Uranium Corp., Chicago, George B. Guillotte, bid $167,850 for mineral rights on 120 acres adjoining the Midnite Uranium Mine on the Spokane Indian Reservation. Bids for rights on the property were opened July 14 at the Colville Indian Agency, Nespelem, Wash.

Guillotte's bid was highest of four on the property. Newmont Exploration, Ltd.,

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7. Less wear on the drill motor and hoist.

RESULT — Higher core recovery at lower cost per foot.

Here are the advantages we list in our Bulletin #201 describing the Wire Line Core Barrel

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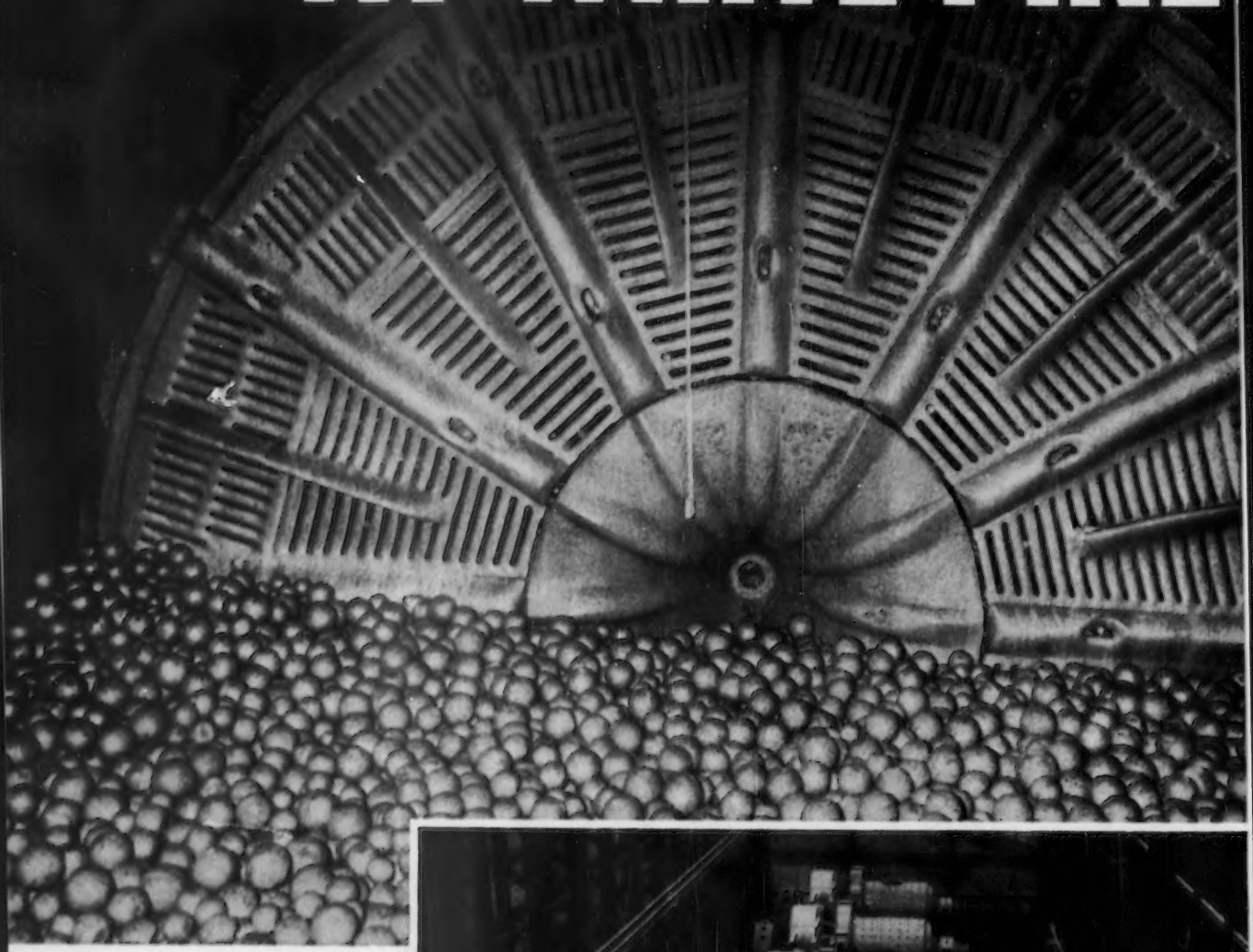
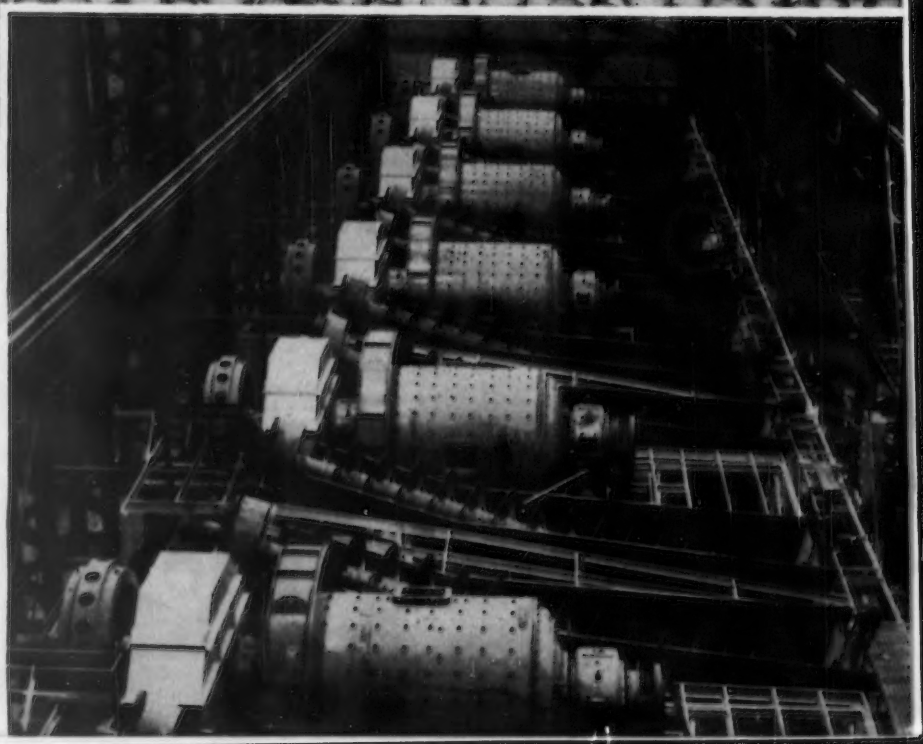
AT WHITE PINE



Interior of huge ball mill at White Pine. Lorain Rolled Plate Liners have been heat treated to compensate for severe wear at feed and discharge end.



White Pine Copper Company's ball mill bay. USS Lorain Liner Plate is also used in the re-grinding operation that follows.

See the United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

Largest diameter ore reduction ball mills built

...use USS LORAIN Rolled Plate Linings

USS Lorain Rolled Plate Linings are snug-fitting because they are made to accurate size. This eliminates shell wash damage.

OFFICIALS OF the new White Pine Copper Company turned their backs on standard procedure and made ore grinding history when they decided on the ball mills for their Copper Concentrating plant at White Pine, Michigan.

After months of calculations, testing, and study of flow sheets, this progressive company went far beyond the accepted maximum size of mills previously used for ore reduction. Looking forward to the last word in efficiency and economy of operation they elected to use mills of the largest practical diameter that could be shipped by rail. The result—an initial battery of six Marcy grate mills 12′ -6″ diameter inside shell, 13′ -0″ active lining length, 90-ton ball load, 1500 H.P. motors—built for White Pine by Mine and Smelter Supply Co. of Denver.

When it came to mill lining specifications, the important considerations were longer life, minimum maintenance and maximum grinding efficiency under the terrific impact and abrasion of 90 tons of ball activity. *USS Lorain Rolled Plate Linings* were specified.No other lining could provide:

1. Rolled steel of special toughness eliminating breakage even when worn paper thin.
2. Parts made to accurate dimensions with close tolerances permitting snug fit, eliminating shell wash.
3. Retention of lift from installation to replacement—resulting in continuous grinding efficiency.
4. No backing required under lining to absorb shock.
5. Longer life translated into lower cost per ton of ore ground.
6. Consistent performance of renewal linings.

The performance of USS Rolled Plate Linings has been highly satisfactory to the operations personnel at White Pine. Any operator, regardless of mill diameter, length, material ground, or special conditions, can get the same degree of satisfaction by specifying *USS Lorain Rolled Plate Linings.* The linings can be purchased through leading mill manufacturers. For additional information write to Room 4929, United States Steel, Pittsburgh, or consult the nearest U. S. Steel District Office.

USS Grinding Balls can help you get better performance from your grinding mills. They are made of special composition steel to make them wear long and evenly. Samples from each production are thoroughly tested to assure high surface hardness and maximum hardness penetration. They come in eleven sizes from ¾″ to 5″.

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS LORAIN ROLLED PLATE LININGS *and* USS GRINDING BALLS

5-1464

UNITED STATES STEEL

Washington *(Continued)*

which is a subsidiary of the Newmont Mining Corp., New York, bid $67,000 for mineral rights to the tract. Phelps Dodge Corp. bid $10,104 for the rights, and a chain grocery operator, L. B. Sigman of Yakima, bid $87,100.

Guillotte also entered the only bids on three other nearby tracts offered for mining lease: $5,650 for two units of 114 and 120 acres, and $2,325 for rights on a 104-acre area.

Land belongs to the Boyd family of the Spokane Indian tribe. Family has been named in a federal court suit filed in Spokane by Roland C. Bartlett, who seeks a court order forcing the Department of Interior to approve leases he claims to have signed in December 1954, with nine members of the Boyd family.

Silver Dollar Mining Company has leased 600 acres of land from Oliver Fine and five adjoining claims in Ferry County, where promising radioactivity appeared on the surface. Drilling was scheduled to begin about Aug. 1.

The property lies in the Bisbee Mountain district across the Columbia River from the community of Kettle Falls, and adjoins holdings of Sunset Mines.

Silver Dollar also holds leases on several thousand acres near Mount Spokane where radioactivity has been found by prospecting crews. The most promising surface reading occurred in the Blanchard Creek area about three miles northeast of the Daybreak development near Elk. Bulldozers have been used to cut through the overburden in initial development work.

American Silver Mining Co. has taken prospecting rights on more than 1000 acres of state-owned land in Stevens County, Wash. E. W. Conrad, president, said in a letter to stockholders that the claims, in five different groups, are being acquired for stock and $100,000 payable only from 10% of production. Hugh C. Van Valkenburg & Associates, Seattle, obtained the claims and will supply funds for exploration.

Valkenburg firm has contracted to buy 60,000 shares of American Silver's nonassessable capital stock at 25c a share and 40,000 shares at 35c each, with an option to buy 25,000 more shares at 50c. Utah claims are in Emery, Wayne and San Juan Counties.

Polaris Mining Co. operates American Silver's property in Stevens County, where heading has been advanced about 350 ft a month recently. Diamond drilling was begun late in June to test known parallel vein structures. American Silver also is acquiring 35 claims in southeastern Utah.

Uranium Associates, Inc., a Spokane company made up of members of Lawton Printing, Inc. has filed articles of incorporation in Olympia with capitalization listed at $50,000. It developed from a prospecting venture started early in the year in the Mount Spokane area. It will prospect for and develop radio-active materials on its leased land. Frank H. Lawton is president; Frank A. Lawton, vice-president, and Gene Schumaker, secretary. In addition to the above officers the directors are Ralph Peterson, Carrol Marquardt, Malcolm Mickelwright and Donald Fransen.

The Dahl brothers, Leonard O. and Alfred D., who discovered autunite on their father's farm in the Mount Spokane uranium area, have filed on 20 mining claims near Orient in northwestern Stevens County. They report having found uranium there associated with copper and gold in quartz veins. Drilling is planned to determine whether it is of commercial value.

U & W Uranium, Inc. has found uranium ore north of Orient in Stevens County, and according to Thomas J. Linton, Spokane, president, the ore assays 2.82% uranium oxide. Tests have also shown the ore to contain thorium, titanium and other rare earths, Linton reported. Six other radioactive outcrops have been found. Company has a lease on 320 acres with 11 adjacent mining claims staked. It has also leased 143 acres in the uranium district of Mount Spokane and 50 mining claims in San Juan County in Utah. The company is capitalized for 40-million shares with directors and promoters holding (some over 13-million) of the shares.

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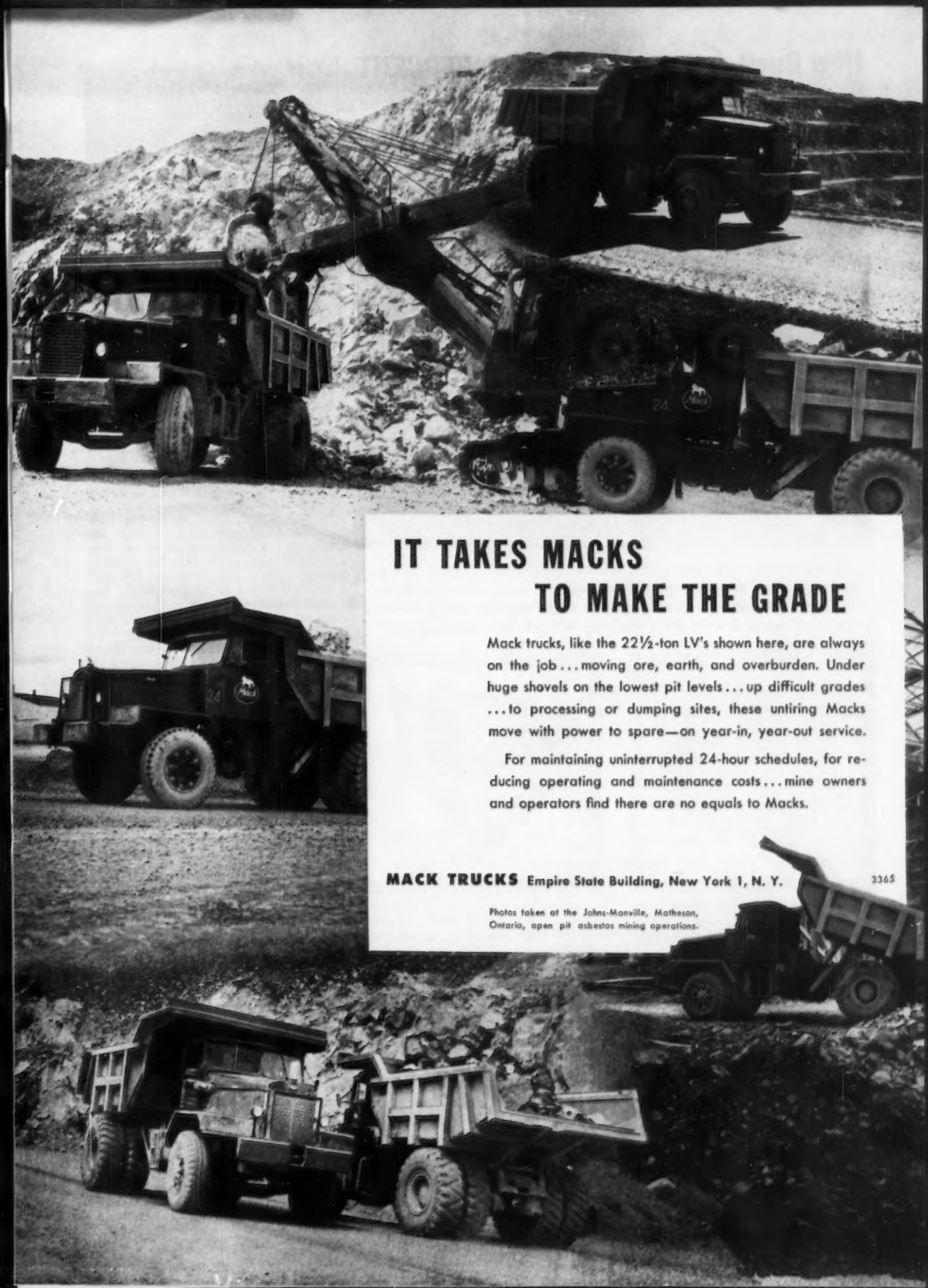
How Buell delivers the EXTRA PERCENT



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Mack trucks, like the 22½-ton LV's shown here, are always on the job... moving ore, earth, and overburden. Under huge shovels on the lowest pit levels... up difficult grades ...to processing or dumping sites, these untiring Macks move with power to spare—on year-in, year-out service.

For maintaining uninterrupted 24-hour schedules, for reducing operating and maintenance costs... mine owners and operators find there are no equals to Macks.

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Photos taken at the Johns-Manville, Matheson, Ontario, open pit asbestos mining operations.

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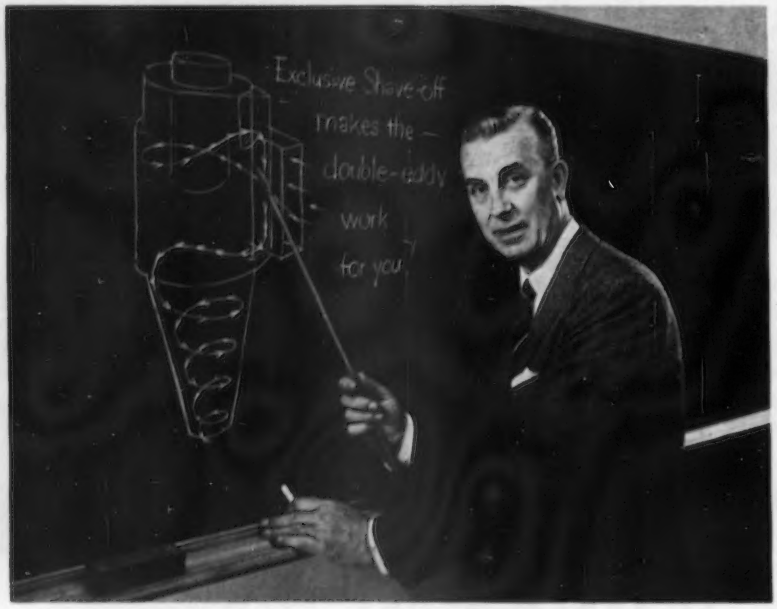
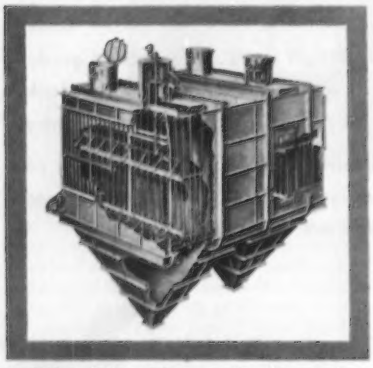
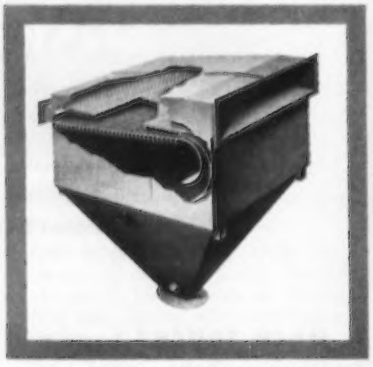


In any cyclone dust collector there is an upward eddy preventing the separation and dropping-out of a percentage of particles. But in Buell Cyclones, the exclusive Buell shave-off design *harnesses* this up-flow—puts it to work! Result: extra efficiency without extra operating cost!



SF Electric Precipitator, a Buell exclusive, also delivers *extra efficiency* due to unique Spiralectrodes and continuous cycle rapping.



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Washington *(Continued)*

A public stock offering of 12-million non-assessable shares at 1c each is being made. Ralph A. Gering, Ritzville is vice-president and S. Everett Salter, Spokane, secretary-treasurer.

Daybreak Uranium, Inc., loaded its first car with uranium ore late in July, the ore being trucked to Spokane from its mine in the Mount Spokane district. Two cars were to be shipped, according to James W. Fox, president, with 50 tons to the car to see how the ore checked out. Company has a contract with the AEC for the shipment of 500 tons. Present ore is coming from stripping operations.

In leveling off an area to start stockpiling, ore was uncovered over an area 65 ft by 35 ft. Some original cuts of 4 ft were deepened 18 added inches and numerous veins of autunite were exposed.

The diamond drilling program is proceeding. Hole No. 5 had penetrated 57 ft. of ore of shipping-grade value in mid-July, Kae Sowers, secretary-treasurer, reported. The ore was cut at a depth of 11 ft. and tests indicated .20 to .44% uranium oxide. Work was done by John Beatty, contractor of Metaline Falls. No. 5 which had been discontinued at 90 ft. by the AEC was later reported to have cut ore from the 91-ft. point to 106 ft., hole No. 6 found mineralization from 10 to 30 ft. deep, and hole No. 7 cut an unknown vein at a depth of 15 ft. and was still in ore at the end of the day when it had reached 20 ft. This was reported by H. W. Norman, company geologist. They expect to cut the main veins at much greater depth. According to James W. Fox, president, one rig is working under contract and a second has been purchased. Fox recently returned from a trip into Colorado and California where he inspected uranium mines with the idea of possible purchase.

When a group of Spokane and eastern investment brokers visited the operations of Pend Oreille Mines & Metals Co. in July, mine officials told them that all three 800-ton-per-day units of the concentrator would be in operation continually by September 1. The incline conveyor belt would have its third section installed for bringing the ore to the surface.

Pitchblende has been located during drilling on the Spokane Indian Reservation, but it was not the principal mineral encountered. A report by Ernest E. Thurlow, chief of the AEC's Salt Lake City exploration branch, indicates continuity of mineralized zones, at the Midnite Mines property.

Thurlow's report said in part, "Although the 13 holes on the Spokane Indian Reservation were mostly spaced at wider intervals than it is safe to project mineralized zones, the results indicate general continuity of the zones.

"Most of the uranium occurs as secondary minerals, principally autunite and uranophane," the report said. "However, Pitchblende (uraninite) associated with pyrite has been identified from drill cores in relatively unoxidized material."

Dawn Uranium & Oil Co. started dia-

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Three MARION 4161 machines are busy in a multi-million-yard stripping operation for a Canadian mine to uncover rich iron ore deposits. Stripping up to 100 feet of rock, these heavy-duty shovels have hard digging all the way. Tens of thousands of tons are loaded every 24 hours.

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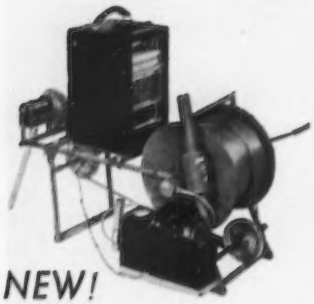

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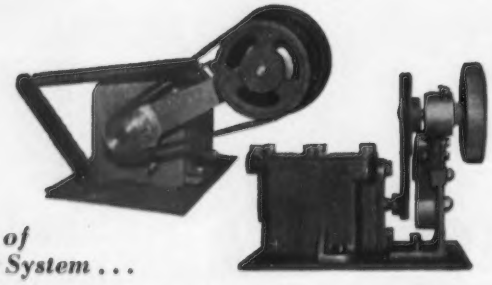

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Ensign Centrifugal Switches for belt conveyors provide belt protection and sequence operation of multiple conveyors including shaker or chain conveyors feeding onto belt conveyors. Bulletin 1100 Centrifugal Switch, left above, has dust-tight enclosure. Bulletin 1101, right above, has explosion-tested enclosure.

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Washington *(Continued)*

mond drilling a radio-active outcropping at its Spokane County property late in July. C. R. Echlin, secretary-treasurer reported. The Wieber-Wisemore west of Mount Spokane where work was started is approximately three miles northwest of the discovery by Daybreak Uranium.

WYOMING

Bureau of Land Management approved Aug. 5 a land order opening 46,440 acres of land near Pumpkin Buttes, Wyoming, to mineral leasing and mining location on Nov. 17, 1955.

The land consists of 7,520 acres of public domain being opened to homesteading and other forms of public entry Aug. 18, 1955, and 38,920 acres of patented land being opened Nov. 17 to mineral entry.

Acting Secy. Clarence A. Davis said 18,903 acres of state-owned and patented lands (on which the owner holds fee simple title to the minerals as well as to the surface) "are unavoidably involved in the order."

He stressed "the order does not allow any prospecting or public land entry on these lands." They include 3,840 acres of state land and 15,040 acres of private land. The 13-acre discrepancy is attributed to lot acreages.

About 65,343 acres were scheduled to be opened May 3, but the Interior Department cancelled the order in answer to Gov. Milward L. Simpson's request. He said there might be violence.

Shortly before the scheduled May 3 opening, surface-owners protested that prospectors were interfering with lambing and calfing and destroying property. Prospectors contended landowners were obstructing mineral exploration in violation of federal law.

The land had been withdrawn from early 1952 through 1954 for a survey by the Atomic Energy Commission. William N. Sharp, USGS geologist, said more than 250 uranium occurrences have been examined, 66 in the withdrawn area. Uranium minerals are visible at most of these places.

Sharp said the occurrences of uranium may be conveniently classified according to their different habits and mineralogical associations into three main types:

(a) Disseminated uranium minerals in porous sandstone or concentrtated around calcite-enriched sandstone;

(b) manganese oxide concretions enclosing or closely associated with oxidized uranium minerals;

and (c) Uraninite concretions with pyrite.

Gov. Milward L. Simpson said he will ask law enforcement officers before Nov. 17 to remove all prematurely placed stakes.

Cheyenne Mining and Uranium Co. of Omaha started shipping commercial ore in late July from its Beaver Rim property in Fremont County. Most ore so far uncovered is in a hydro-carbon deposit, but ore also is being found in other sand-

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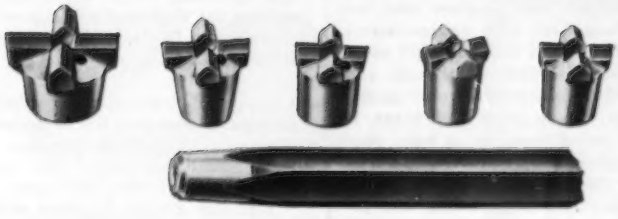
CRD One-Use bits with ANY drill spell PROFIT!

Write for bulletin RD30 on Air Legs and Bulletin RD29 on Bits.

RD-73



CLEVELAND ROCK DRILL DIVISION

Westinghouse Air Brake Company

Wyoming *(Continued)*

stone and shale formations close to the asphalt.

Lost Creek Oil & Uranium Co. informed stockholders in July 300 tons of ore had been shipped from its Ketchum Buttes.

Shipments also are being made from the company's eight Snow-Ball claims in the Crooks Gap area of Fremont County.

Mack-Lang Uranium Co. joined the "shipping ore" list in July, with delivery of a 12-ton load to the Riverton buying station. Ore was from the company's claims on Lost Creek.

Thirty-eight truckloads were received at the AEC's uranium ore-buying station at Riverton in one day in July, to set a new record. Manager Charles Bruner said tonnage had increased "terrifically" since the station was opened March 1.

Dravo Corp., Pittsburgh, Pa., has been awarded general contract for sinking a 1,600 ft ventilation shaft at the trona mine at Westvaco of the Intermountain Chemical Corp.

Intermountain is an affiliate of Food Machinery and Chemical Corp. and National Distillers Products Corp.

N. E. McDougal, acting plant manager, said there were about 10 contractors bidding on the project on which 50 miners will start work Aug. 15.

Completion of the $1.25-million venture is scheduled for next year.

While not a working shaft, addition of better ventilating facilities will actually lead to a substantial hike in trona production, McDougal said.

Wyoming Uranium Corp. has shipped its first ore from the Beatric mine at Crooks Gap district to the AEC's buying station at Riverton.

The firm had shipped 1,200 lb of good grade ore to June 30 date from its Helen May mine a mile from the Beatric property in the same district.

Four full-time prospectors for Wyoming Uranium Co. have reported finding 30 potential new orebodies on the firm's 100 claims in the Crooks Gap area of Fremont County.

Firm began shipping ore in May when they trucked 48 tons to the AEC buying station at Riverton. In June they shipped 136 tons. At mid-July they had shipped 60 more tons.

Fred S. Haley, company mining manager and geologist, said: "Generally speaking, we find the highest concentrations of uranium mineralization in the 10 to 20 ft of Wasatch lying above the contact with the Fort Union formation."

Intensely interested in development of the Hecla Mining Co. Radon orebody are these three men—left to right, W. E. McCormick of Bountiful, Utah, former Moab prospector; R. B. Daniel of Grand Junction, also a former Moab prospector, and William Love, Radon superintendent for the Hecla Mining Co. McCormick holds a royalty interest in Radon production. Daniel, who first staked the Radon claims, now is a director of Federal Uranium Corp. Love is directing sinking the shaft and will supervise production for Hecla, which will share in Radon profits.

Commercial uranium ore production in an asphalt sandstone has been started by Cheyenne Mining and Uranium Co. of Omaha on top of Beaver Rim, southeast of San Draw in Fremont County.

President Parker Erickson said: "We plan to begin steady shipping immediately now that we have been granted our

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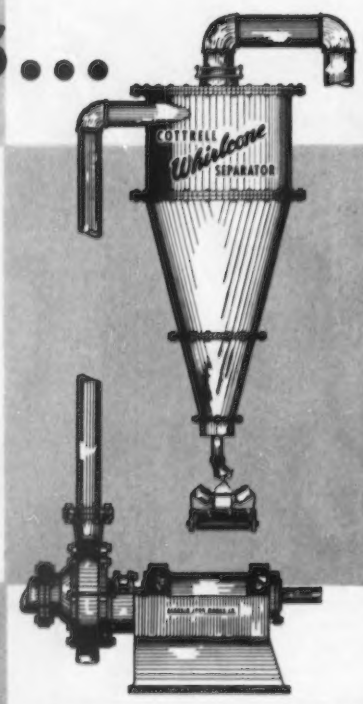

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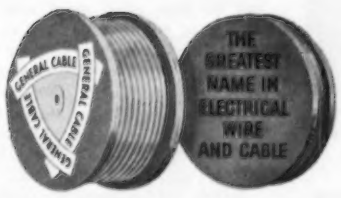

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in the heart of the jungle

Acker Hydraulic Feed Teredo Trailer Mounted Diamond Core Drill drilling for chrome ore deposits deep in the Jungles

This trailer mounted Acker Teredo Diamond Core drill is hard at work locating and proving chrome ore bodies deep in the heart of a tropical jungle. The operators know from past experience that Acker builds rugged dependability into every drill—yet, essential elements are so light and compact that they can be carried by plane or mule-back.

Want proof? Then write today for Teredo Bulletin 30. EMJ.

ACKER DRILL CO., Inc.

725 W. Lackawanna Avenue

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a complete line of Diamond and Shot Core Drills, Drilling Accessories and Equipment

Wyoming *(Continued)*

contract with the Atomic Energy Commission.

"We're moving heavier equipment in and will begin large scale mining operations immediately."

Erickson said two pilot loads of the asphaltic type ore proved to be of commercial quality.

John H. White, Jr., Salt Lake City, president of Uranium Corp. of America, reports that the firm's Riverton (Sandy area) orebody contains an estimated 1,440,000 tons of uranium ore.

Reporting on results of drilling assay holes by five rigs, White said the ore had an average grade of 0.15% uranium oxide. The ore is 10-20 ft thick.

White said the estimated 1,440,000 tons and the grade mentioned in the assay report gives a value of approximately $9 a ton.

Uranium deposits on the Wind River Indian Reservation in Wyoming could produce up to $10 million worth of ore, according to Robert F. Parker, Riverton, Wyo., geological engineer.

Parker said there is an abundance of the same types of geological formations on the reservation as in the uranium bearing areas of the Gas Hills, Crooks Gap and Copper Mountain, in uranium-rich Fremont county.

IN CANADA

BRITISH COLUMBIA

Largest single cargo of its kind to be shipped by barge on British Columbia's coast was undertaken last month when Island Tug and Barge Ltd. of Victoria and Vancouver moved 121 smelter pots from Portland to Kitimat.

Shipment and installation of the smelter pots is part of Aluminum Company of Canada's $190-million expansion program at its northern British Columbia operation.

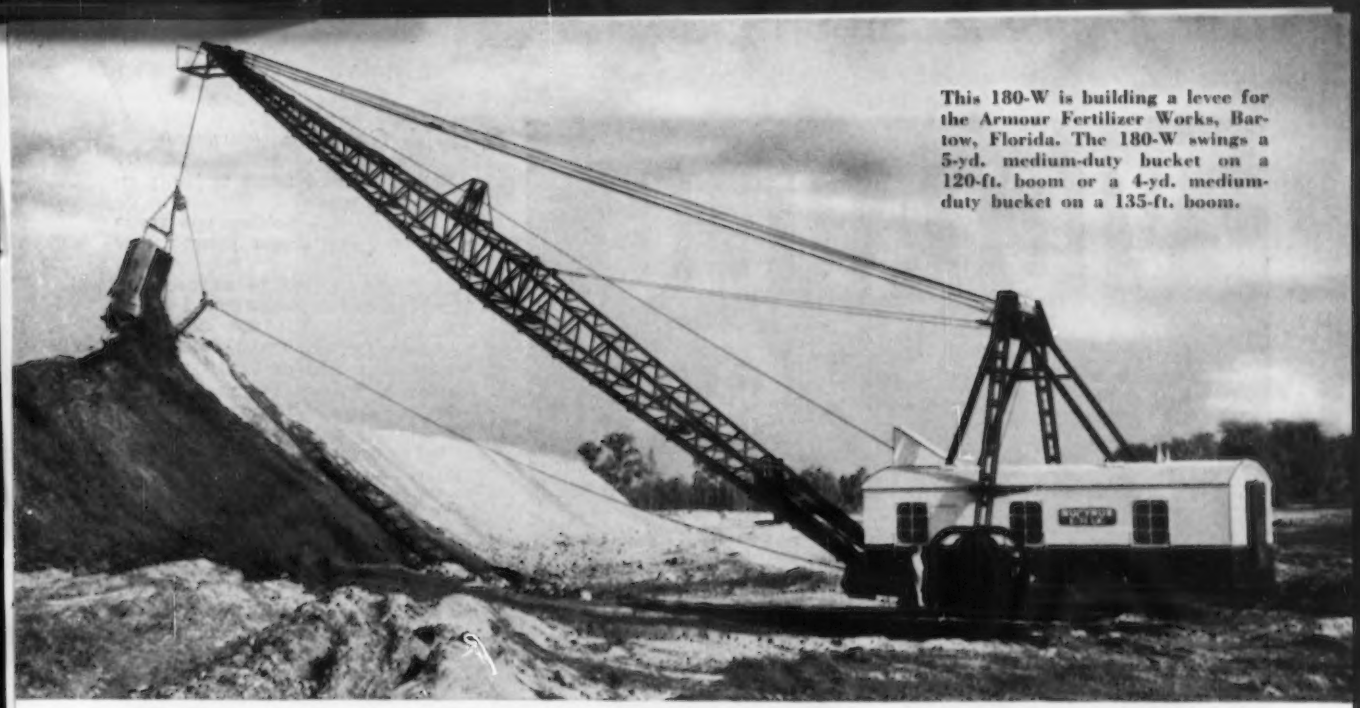
Each pot is 30 ft long, 14½ ft wide and 3½ ft deep. They were supplied to Alcan by Williamette Iron and Steel Co. of Portland and American Pipe Construction Co.

The 785-mile journey was tackled by 252-ft steel barge "Island Logger" in tow to deep-sea tug "Island Navigator" under supervision of Norman Turner, marine superintendent of Island Tug.

Western Tungsten Copper Mines, Ltd. of British Columbia has decided to sell out its Red Rose plant and equipment and form a new company to be known as Far West Tungsten Copper Mines Ltd.

New company will take over assets of Western Tungsten to pursue new ventures, according to statement by president Donald Farris of Vancouver, who said about $250,000 would be realized through the sale.

Farris said reason for reorganization was that Red Rose mine has been shut down for some time and price of tungsten is not expected to improve



This 180-W is building a levee for the Armour Fertilizer Works, Bartow, Florida. The 180-W swings a 5-yd. medium-duty bucket on a 120-ft. boom or a 4-yd. medium-duty bucket on a 135-ft. boom.

BIG CAPACITY Digging Ability... Readily Moved From Job to Job

BUCYRUS-ERIE 180-W WALKING DRAGLINE

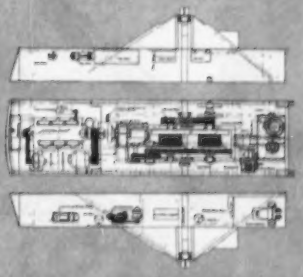
Mining and quarrying jobs need the economical, high-capacity dirt moving offered by Bucyrus-Erie walking draglines. The new 180-W has it plus unmatched ease in moving from job to job.

The 180-W is readily dismantled — only partial disassembly is necessary for moves. No main machinery components are disturbed; misalignment problems are eliminated. Ease of moving saves time and expense and greatly increases the 180-W's value throughout its life.

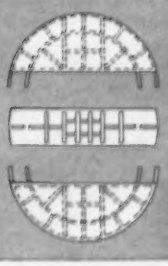
Along with its unusual portability, the 180-W brings to more jobs the dependable, big-output performance; quick maneuverability; long working range; and low maintenance costs that are traditional in every Bucyrus-Erie walking dragline. Send for complete information.

38L55C

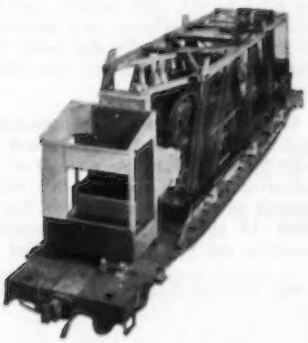
FIVE U.S. RAILROAD CARS CARRY ENTIRE MACHINE



Side wings unbolt from center section of revolving frame. Main machinery remains fully assembled, stays in proper alignment.



Base is in three separate welded steel sections, joined by bolting flanges—easily disassembled and shipped.



The operator's cab and center section of the revolving frame, loaded on a flat car for shipment, are shown here.

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Style 99 for plain or beveled end pipe. Best engineered, most useful plain end joint on the market. Simple, husky — easy and fast to install. Takes strong bull-dog grip on pipe. Sizes 2" to 8".

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Victaulic's new boltless, speed coupling. — Style 78 — hinged into one assembly. Hand-locks for time and dollar savings. Sizes 1", 1¼", 2", 3", 4".

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British Columbia *(Continued)*

sufficiently in near future to justify reopening.

Company's main holdings now are in Highland Valley copper prospect near Ashcroft.

New company will be authorized at $3-million capital divided into 3-million shares. Total of 1,165,000 shares will be issued. Of this 900,000 will go to holders of a total of $450,000 in debentures of Western Tungsten.

Present shareholders are to get one share in the new company for every 10 shares they now hold for a total of 265,000 shares.

In new progress report, Cowichan Copper Co.'s consulting geologist Dr. A. C. Skerl states "reasonably assured" ore reserves of 140,000 tons averaging 6.2% copper content have been blocked out at its Vancouver Island property.

Dr. Skerl reports that estimated reserve is calculated to equal nearly 1-million tons of 2% copper ore.

Development includes 2,265 ft of drifting and cross-cutting on the 1200-level and 400 ft on the 1920-level with 800 ft of raises between. Diamond drilling consists of 5,272 ft. in 26 holes from underground stations and 1,545 ft in eight holes started from the surface.

Dr. Skerl said ore was between surface and a point 50 ft below the 1200-ft level and extends 130 ft horizontally south from the flat fault.

Alberta company called Combined Developments Ltd. reports one of its prospecting parties has discovered a deposit of molybdenite in the Atlin area of northern British Columbia.

Company reports six claims have been staked to cover the showing and possible extension of the discovery zone. It is in virgin mining country near shore of Willison Bay on Atlin Lake, 25 miles southwest of Atlin.

Consolidated Mining and Smelting Co.'s H. B. Mine at Salmo, now is operating with about 150 men. Underground development and new mine buildings, including a 1,000-ton capacity concentrator were completed on the site in 1953 at cost of $3-million and shipping of concentrates began in May.

Mine superintendent is H. G. Barker and property superintendent is J. C. MacLean.

H. B. orebody is a low-grade zinc-lead deposit which lends itself to long blast drilling. Ore raises have been driven to carry the broken ore down to a 4,000-ft haulage tunnel at the 2900-ft level.

Concentrates are being trucked from the mine to the Trail smelter, and both mine and concentrator are working a 24-hour schedule with the mine operating on five-day week and concentrator seven.

Mining operators and prospectors in British Columbia and Yukon heard with relief this month that as a result of their concerted efforts during the winter, Federal government at Ottawa has decided to shelve legislation drastically amending the Yukon Quartz Mining Act.

here.

Wisconsin

Shape of the Earth

Diagram showing magnetic field for 2-coil, 36-in.-dia., 42-in.-wide pulley. Note how magnetic field blankets entire load.

New magnetic pulley stops tramp iron riding the load peaks

This new Stearns 2-coil electro-magnetic pulley effectively removes tramp iron riding the crest of a conveyor load as well as the pieces that pass close to the magnet's face. Two-coil design produces a powerful magnetic field that is deepest at the center of the conveyor belt where load is heaviest. Thus, the area of magnetic attraction is the same general shape as the load on a conveyor operating under standard conveyor practices.

Smaller, lower-cost pulleys now practical

Because of the nature of the magnetic field, smaller pulleys costing less can now be used on jobs where larger units were formerly needed. An examination of data on a number of proposed installations showed that, in the majority of cases, the recommended new 2-coil pulley was of smaller diameter than a 3-coil pulley of comparable ability.

New, simple pulley selection method*

Because this pulley fits right into recommended conveyor standards for speed of belt travel and depth of load for various types of materials, it is far simpler to select the right pulley than ever before. Stearns provides new selection tables in Bulletin 303-C that now make it possible for you to select the right size unit for your job even before you consult our sales engineers.

Get all the facts on this new magnetic pulley. Find out how it simplifies pulley selection. Write for Bulletin 303-C.

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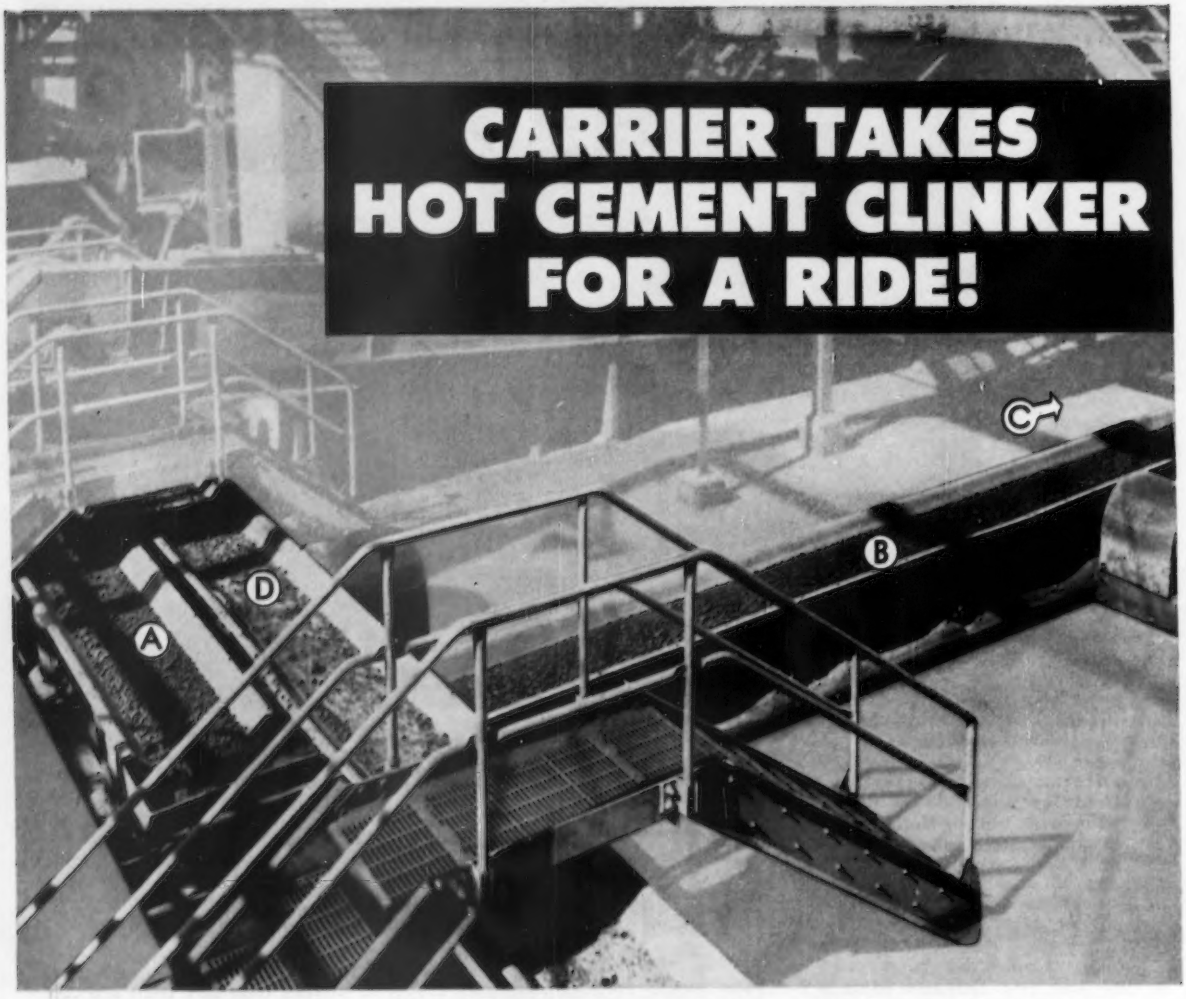
1133

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS MAGNETS

STEARNS MAGNETIC, INC., 624 S. 28th St., Milwaukee 46, Wisconsin



Carrier Conveyor "A" takes the clinker from coolers and feeds it at right angles onto the first of two other Carrier Conveyors "B" ("C" not shown) for delivery to a bucket elevator and storage.

Carrier Conveyor "D" also takes the clinker from coolers, but conveys it directly to a different storage pit.
All four conveyors have 18" flared pans and 5HP drives, with a total length of 233'.

THAT'S hot cement clinker you see on those four Carrier Natural-Frequency Conveyors. It's being taken for a ride from coolers to two different storage pits. . . .

400° F. clinker is extremely abrasive — extremely tough to handle. Yet the Carrier Natural-Frequency Conveyors move it at the rate of 60 tons per hour with *a minimum of spillage, maintenance and downtime!*

Cement-industry applications are just one of many uses for Natural-Frequency Conveyors. Others include bulk chemicals, castings, ores, mill scale and slag, food products, machine turnings — all of which are now being conveyed and processed with spectacular success by Carrier Natural-Frequency vibrating equipment. Write for Bulletin 111. Carrier Conveyor Corporation, 247 North Jackson Street, Louisville 2, Kentucky.

CARRIER
~~NATURAL-FREQUENCY~~
CONVEYORS

British Columbia *(Continued)*

Northern Affairs and National Resources Minister Jean Lesage said in Commons he originally intended to have the bill (Bill 482,) referred to the House committee on mines and forests where Yukon mining men could make representations on the proposed revisions. but this was a bad time for Yukon miners to go to Ottawa and give detailed study to the proposal. For this reason, the government merely read the bill for the first time, distributed it for study in the Yukon and will take it up again next session of Parliament.

Northern and western mining people now have time in which adequate consideration can be given to the contentious amendments which sought to make provision by means of a new act for "all substantive rights relating to quartz mining in the Yukon, including the rights to stake and acquire mineral claims and leases, and to provide for certain modifications in the administration of the law".

Ire of mining people was aroused mainly by part of the amendments which sought to establish four-post staking, which is considered wholly impractical throughout the rugged Yukon terrain.

Yukon prospectors and mine developers are congratulating Yukon Member of Parliament J. Aubrey Simmons, who successfully brought about postponement of any action by the Dominion.

Supported by a great many prospectors and mine operators including such prominent authorities as Dr. William V. Smitheringale and B.C. and Yukon Chamber of Mines, Simmons also received support of many other members in presenting arguments against the proposed legislation.

Now, mining people are campaigning to familiarize as many persons in Yukon and B.C. as possible with all aspects of situation so they may express their collective views to proper authorities before the matter comes before the House of Commons again.

It is opinion of northern mining officials that on preliminary reading, Bill 482 still contains several provisions that appear difficult to reconcile with experience gained in the Yukon over a period of more than 60 years.

British Columbia mining observers believe that the inland town of Stewart is on the eve of its third big mining boom.

Outpost, most northerly deep-sea port in the province, will be outlet for the Granduc Copper mine when that massive undertaking comes into production.

Granby Mining and Smelting Co.'s property is some 30 miles north of Stewart, but on the other side of a mountain range. Granby staked the claims in 1953 and despite the fact that most of the property lay under a glacier, the company by use of modern equipment has already been able to map out about 30-million tons of commercial copper ore.

Expectations in Stewart are that within a few months Granby will decide to proceed with the undertaking.

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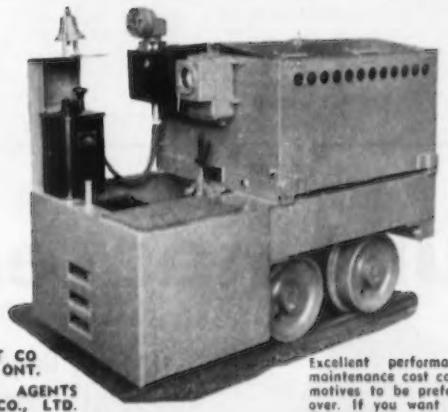

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British Columbia *(Continued)*

Before that can happen, Granby will have to cut a 12-mile access tunnel through the mountains to enable the copper ores to be shipped to tidewater near Stewart.

Stewart came into prominence first in 1906 when it was spotted as terminal for a trans-Canadian railway that would use the Pine Pass route through the Rockies. Money from United States, Britain, Germany and Canada poured into Stewart and by 1910 practically all the mineralized acreage in the nearby Bear Valley had been staked.

Very few of the mines ever got into production and the bubble burst when in 1913 it was finally decided not to proceed with Pacific Northeastern Railway. Speculators in real estate in Stewart lost their fortunes and the population of the town dropped quickly from 10,00 to 17.

Stewart's second boom was a more realistic matter because it coincided with opening of famous Premier Gold mine, which from time it started in 1917 has paid its shareholders more than $16-million in dividends.

This time there is hope Stewart may achieve a greater permanence to its third expected boom, for it now is mapped as southern outlet of a road that will run through northern British Columbia and connect with Alaska Highway near Watson Lake.

When this road is completed, Stewart will probably become a major port, for it is said to be logical point for shipping out to the world markets the ores from Cassiar Asbestos mine also, as well as ores from many other properties only awaiting a road to put them into production.

More than 1,600 claims have been staked and recorded in the Fort Smith area of Northwest Territories, since the uranium rush began in April, according to Federal district administrator Laco Hunt.

"There is every indication that interest in the areas here is increasing rather than decreasing," said Hunt.

Reports so far have referred only to high magnetometer readings, and there has been no word yet as to assay results. Several companies are reported interested in the area, but have not been identified.

Favorable assays of uranium samples from Grease River and the finding of promising indications at McInnes Lake, N. W. T., is reported from Uranium City by George E. Midgley, field engineer for Reward Uranium, a company headed by M. Hallmark of Edmonton.

Samples secured on uranium deposits at Grease River by diamond drilling have ranged up to 0.22% U_3O_8. From gently dipping beds of secondarily altered quartzites, deposits are of a different nature from any previously developed in the Beaverlodge area, the mining engineer reports. Accordingly, the exploration program will require time and effort before it can be determined whether there is a commensurate tonnage of ore to a content of 0.10 or better. Company has staked a group of claims at McInnes Lake where its prospectors reported discovery of uranium-bearing structure.

MANITOBA

Aggasiz Mines Ltd., a newly formed company, is carrying out an initial drilling program on a group of claims near Lynn Lake, where several anomalies are considered favorable for nickel-copper ore. Company is also carrying out surface exploration on a uranium prospect in the Manigotogan Lake area of central Manitoba.

Violamac Mines Ltd. has two diamond drills developing a lithium prospect near Maskwa Lake, 85 miles northeast of Winnipeg. Main dike, drilled to a depth of 700 ft indicates a tonnage of over 2400 tons per vertical foot, with an average ore grade of 1.3% Li_2O. Drilling is now under way to cut the dike at a depth of 1,100 ft. In addition to the main dike there is a parallel occurrence which has been traced on surface for over 750 ft showing a width between 12 and 16 ft. Metallurgical tests on the ore indicate it is quite low in iron and manganese.

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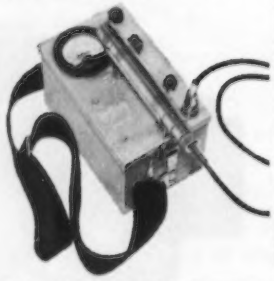

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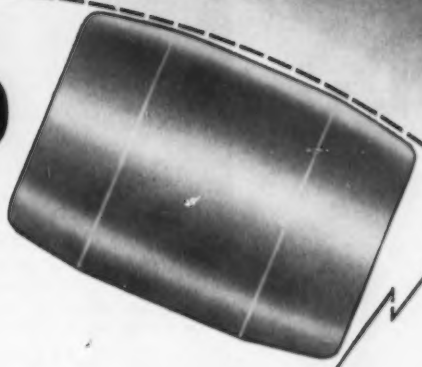

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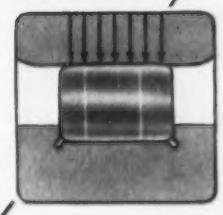

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PROCESSING MILL of Union Carbide & Carbon Corp.'s Union Carbide Nuclear Co., already one of the largest on the Colorado Plateau, is expanding further. Kenneth Rush, president of the new division, says work is now underway and should be completed in autumn of 1956. Present plant will continue at full capacity. Installation is at Uravan, Colo.

Manitoba *(Continued)*

Sherritt Gordon Mines are continuing underground exploration from the 1,000-ft level of the "A" mine at Lynn Lake. Encouraging results have been obtained from the drilling of a new orebody with an average width of 20 ft running 1.7% nickel, 0.7% copper and 0.15% cobalt. Output of the mine and concentrator during the month of May was running better than 10% above rated capacity. Production of nickel at Fort Saskatchewan will soon amount to 20-million lb a year. For the remaining part of the present year production will also include cobalt at the rate of 500 lb per day.

Cuprus Mines Ltd., a subsidiary of Hudson Bay Mining & Smelting, is winding up its affairs and will sell buildings and machinery on the property to the parent company. In December 1954 a dividend of 75c a share was paid bringing the total distribution to $1,150,000 of the 1-million shares outstanding.

NEWFOUNDLAND

Bathurst Mining Co. recently shipped first boatload of copper ore from province in 36 years. Old mine near Tilt Cove on Notre Dame Bay has been reopened and now employs 65 men.

ONTARIO

A fourth company has arranged for the sale of uranium concentrates to the Canadian government's buying company—Eldorado Mining and Refining.

Bicroft Uranium Mines, with property in the Bancroft area, announces that it has received a letter of intent from Eldorado to purchase its estimated output over about five years.

R. A. Bryce, president of Bicroft, would not disclose the price other than to say it was satisfactory. He estimated that the gross value of uranium oxide concentrates to be produced, based on processing of 1,000 tpd ore, at $35,805,000.

A $9-million program to bring the mine to production by September 1956 is under way.

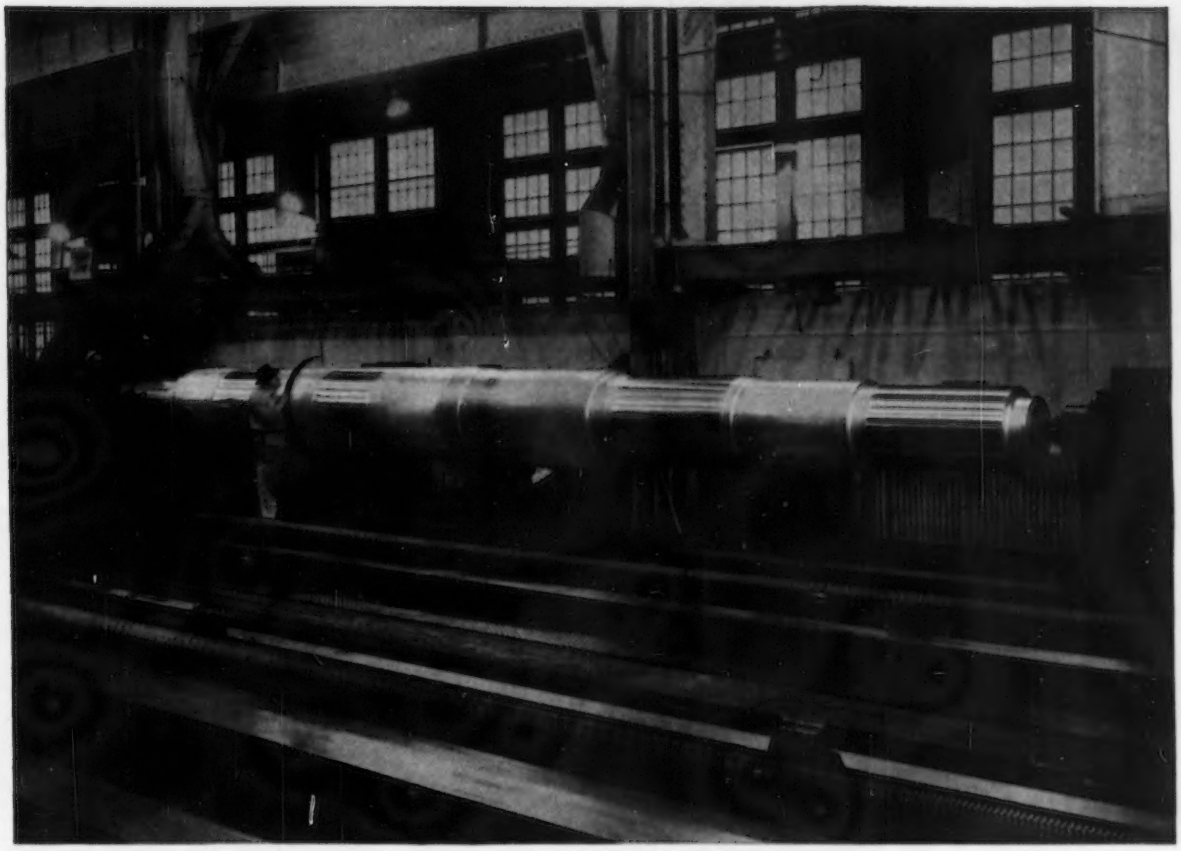
Other uranium companies with contracts with Eldorado are Gunnar Mines in the Beaverlodge area of northern Saskatchewan, and Aglom and Pronto in the Blind River area of Ontario.

Continental Copper Mines has started diamond drilling on a group of 24 claims in Cargill Twp., 20 miles southwest of Kapuskasing. Work is being done to test a broad area of magnetic anomalies paralleled by a series of electrical conductors, the favorable area covering 11 claims.

Another company starting a drill program on a new prospect is Midrim Mining Co., with 27 claims in Twp. 169, 40 miles north of Iron Bridge in the Blind River area. Surface prospecting disclosed a strong copper showing traced along a contact for a length of 300 ft, with high values obtained in grab sampling along a series of trenches.

Paymaster Consolidated Mines, veteran gold producer of the Porcupine camp, is now milling close to 500 tpd, a new record. From the resumption of mining late last year the mill, to the end of May, handled 98,345 tons for production of 22,265 oz gold.

McKenzie Red Lake Gold Mines, one of the earliest producers of the Red Lake gold camp, has turned its attention to graphite, as well. The new property is close to Maynooth, some 18 miles north of Bancroft, where preliminary work has indicated a flat-lying deposit about 1,200 ft long and 35 ft thick. Indicated grade is approximately 20% graphite, a considerable portion being the premium



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This type of service has been routine to the men of Midvale for more than a half a century. They have made a specialty of supplying the mining industry with large forgings and castings of all types. Midvale quality is carefully guarded from the time the ingot is poured until the finished piece is loaded for shipment. Tests and supervised inspections are made in every step of production. Final tests—X-ray, sonic and others as specified—assure sound forgings and stainless steel castings for outstanding performance in the most severe service.

Next time you need shafts, rolls, roll shells, gear rings or high alloy castings get in touch with Midvale. You can be certain of satisfactory service and products.

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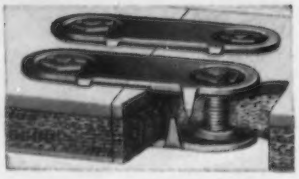

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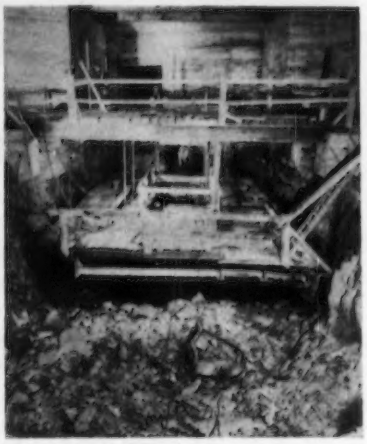
Ontario *(Continued)*

grade flake type. The management visualizes an open pit operation, with production starting at 100 tpd. Subsidiary company, Gleneagle Graphite Mines, has been formed to operate the property.

Following completion of the Canadian National Railway's branch line to the Manitouwadge camp, plans for shaft sinking are being advanced by Willroy Mines. Work is scheduled to start in the early fall, with 1,250 ft the initial objective for the four-compartment opening.

Jonsmith Mines has resumed underground drilling from the 465-ft level of its Milnet property in the Sudbury area, the objective being to locate the faulted downward extension of the nickel-copper orebodies mined out by the former owners.

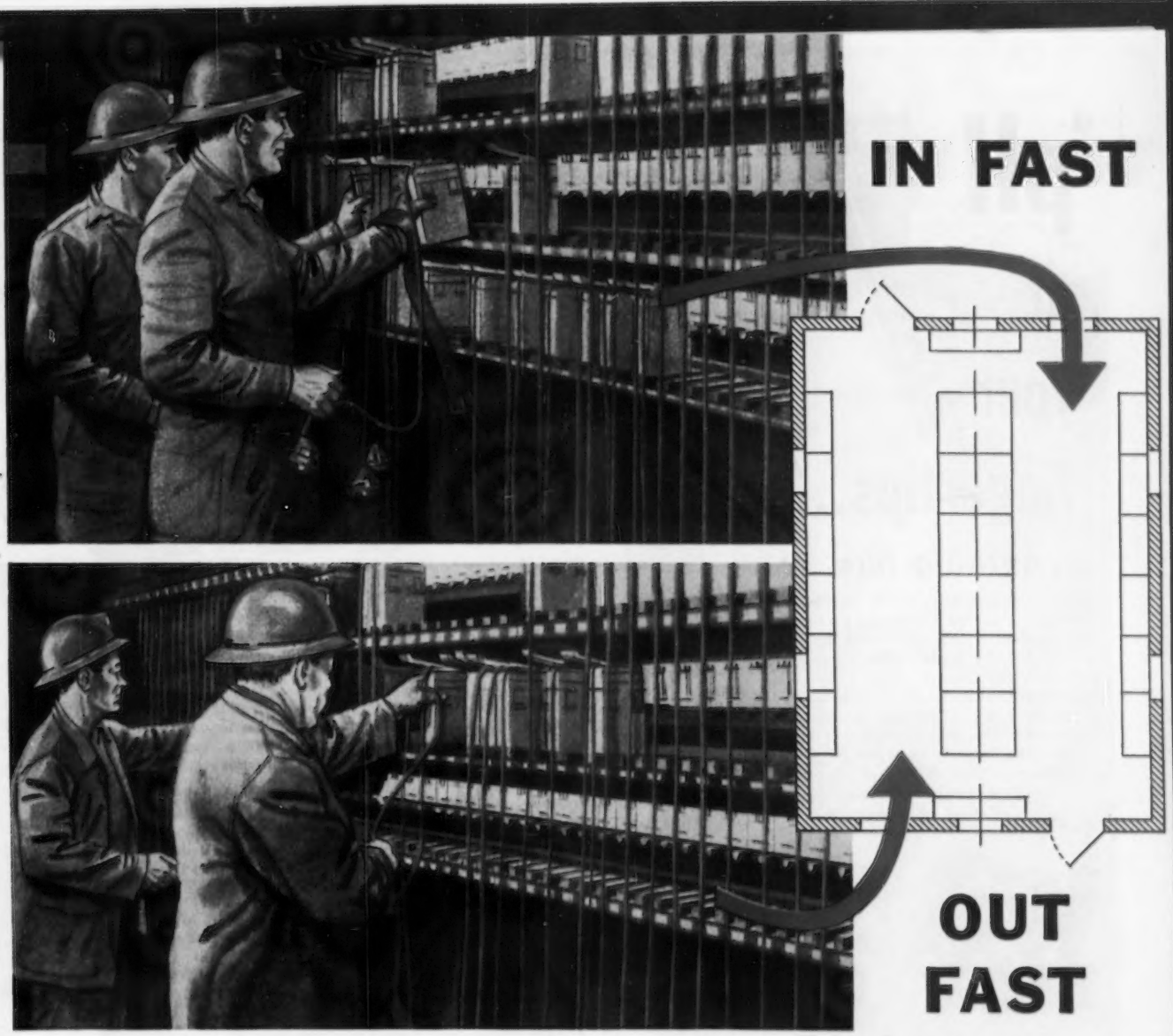
Approximately 3,000 tons of magnetite is being mined daily by Bethlehem Mines Corp. from its big open pit mine near Marmora, in the eastern section of the province. Daily production of high-grade concentrate is running at 1,200 tons, the product being shipped by rail to Picton and thence by boat to the Buffalo plants of Bethlehem Steed Corp., the parent company. Objective for the mine is 4,250 tons of ore and 1,750 tons of concentrates, in pellet form, daily. (See *E&MJ*, July 1955, p 75.)



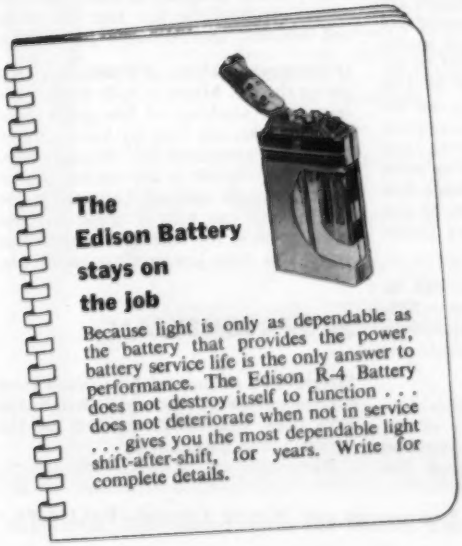
UNDERGROUND CRUSHER STATION at International's Levack mine in Sudbury, is at the 2650 level. Chamber is 70 ft high, 26 ft wide and 68 ft at its longest point. Inco saved two months in construction time by use of longhole drilling methods.

Work is going ahead on schedule on the new mill being built at Nephton, north of Peterborough, by American Nepheline Ltd. Plant will more than double the company's output of nepheline syenite, demand for which has been running at record levels.

Coldstream Copper Mines has started unwatering the shaft on its property 90 miles west of Port Arthur. Mine has been idle for the past three years, but new surface drilling this spring gave



EDISON SELF-SERVICE



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Ontario *(Continued)*

added depth encouragement. Plans call for 800 ft of lateral work on the second level, followed by closely spaced lateral drilling.

Latest drill hole completed by Lake Nordic Uranium Mines on its Blind River property is regarded as one of the most significant drilled in the camp for some months. It returned 17.5 ft averaging 0.13% U_3O_8, intersection being in the deepest of four conglomerate beds; the other three showed marginal grade. Significance lies in the apparent confirmation which the hole gives to the theory of a northwesterly trend for the ore on the adjoining Algom Uranium (Nordic Lake) mine. The down dip extension of this ore has been extended a possible 9,000 ft, the intersection having been cut at a depth of 2,500 ft. (See *E&MJ*, June 1955, p 95.)

QUEBEC

Campbell Chibougamau Mines reports production well up to expectations in its first full month of milling. Mill has been handling 1,800 tpd, slightly above rated capacity, with grade averaging 2.97% copper and 0.114 oz gold per ton; and in June output was 2,478,000 lb of copper and 3,164 oz of gold. On this basis, with ore treated being above mine average, company is ranking within the top dozen Canadian producers.

Another Chibougamau company, a neighbor of Campbell's, is planning to go underground. Merrill Island Mining Corp. is going to unwater its shaft, sunk to 300 ft some years ago, and deepen it to 1,000 ft. Work on the two levels established in the earlier program indicated 700,000 tons of typical Chibougamau copper ore, but operations were suspended to await transportation and power. Meanwhile the company is getting good income in royalty from the 30 acres of its property leased to Campbell Chibougamau. Under the deal Campbell must treat at least 425 tpd of Merrill ore.

Going underground in Chibougamau for the first time is Copper Cliff Consolidated Mining Corp. A shaft will be sunk to 500 ft on the Jaculet zone, which will be explored and developed on levels at 150, 275 and 400 ft. Jaculet group, an 18-claim holding, is held under lease-option arrangements with Jaculet Mines, and was the site of large scale drilling some years ago. Work indicated a large tonnage copper zone, but estimates of size and grade will be dependent of underground results.

Next producer in Chibougamau will be Chibougamau Explorers Ltd., whose 500-ton mill is scheduled to start operations in September, with provision made for quick increase to 750 tons.

Chibougamau Mining & Smelting Co., with 30,000 acres in the heart of the camp, is Chibougamau's latest exploration venture. Property extends through five townships, and large scale geophysical and drilling programs are being laid out. Company was formed by interests associated with the financing of Campbell Chibougamau.

Increase of 50% in milling capacity is planned by Flintkote Mines, asbestos producer with mine three miles east of Thetford Mines in the Eastern Townships. Enlarged capacity of the mill and open pit mine will be 2,250 tpd.

Last minute preparations were being made at press time for the start of zinc-pyrite production by West Macdonald Mines. Ore is to be treated at the enlarged mill of Waite Amulet Mines, a six-mile aerial tram having been constructed to provide transportation from the mine. Mill, with capacity now 2,000 tpd, will treat 1,000 tons of West Macdonald ore each day on a custom basis. West Macdonald is managed by Noranda Mines, which holds 45% interest and an option on an additional 6% interest.

Lyndhurst Mining Co., with property in Destor Twp., north of Noranda, is thinking in terms of production, with a 500-ton mill considered a likely possibility. A considerable amount of lateral work and drilling has been done on the first level, and development is being started on the second. Results to date have been well up to expectations, and the shaft is to be deepened to open two additional levels.

Shaft sinking is in progress at the property of Duvan Copper Co., eight miles southwest of Normetal, with initial objective 500 ft to open three levels.

East Sullivan Mines is going to deepen its main production shaft to 4,000 ft, a depth of 1,000 ft below the present bottom level. Project will take many months, being geared to avoid interference with production, now running at a record rate of 2,600 tpd.

Canadian Titanium Pigments Ltd., National Lead Co. subsidiary, will construct Canada's first titanium pigment plant on a site near Varennes on the south bank of the St. Lawrence River about 15 miles northeast of Montreal. New plant is designed to meet Canada's entire requirements for titanium oxide and will cost approximately $15-million.

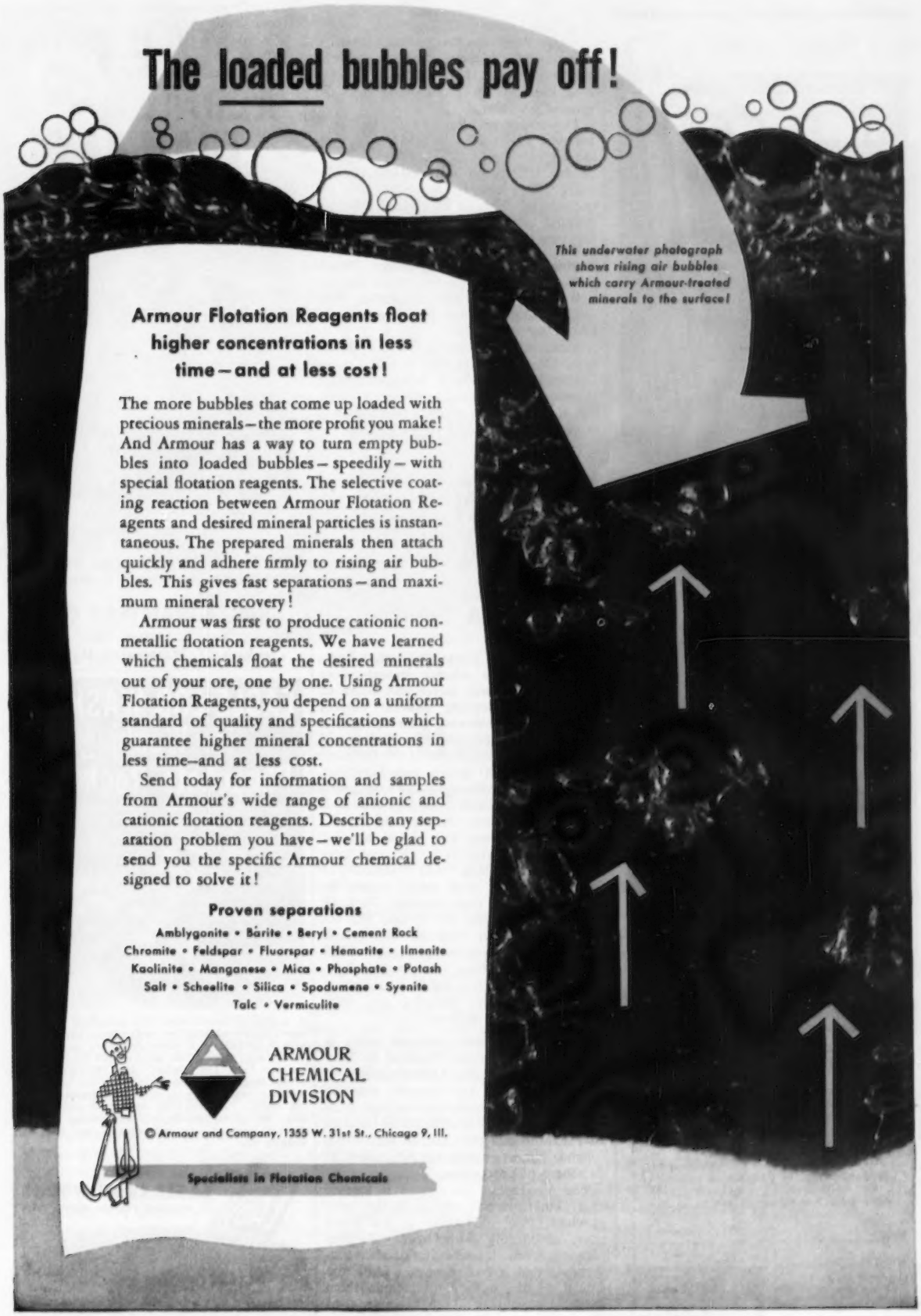
Department of Mines at Ottawa has been testing the Dr. Martin J. Udy process for manganese smelting of low grade ores. Process rights are held by Stratmat Ltd. Dr. Udy is associated with Strategic Minerals Corp., which is considering a pilot plant to test the method. Laboratory-wise the method has proven applicable and holds promise for economic recovery of manganese from low grade domestic ore.

SASKATCHEWAN

Royalties on sodium sulphate mined from government-owned leases in Saskatchewan have been reduced 20 to 33% by the Saskatchewan government.

Reductions are retroactive to April 1.

The loaded bubbles pay off!



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Saskatchewan *(Continued)*

Amount depends upon size of the sodium sulphate plant and the intended effect is a lower royalty requirement for the smaller producer.

Downward revision of rates had been believed advisable since 1951, a government spokesman said, since they were excessive relative to rates on other minerals. Only recently, however, was the question of rights on the royalty collected decided in favor of the province by the supreme court of Canada.

Beginning in early September Potash Company of America will begin excavation of a 16-ft diameter 3000-ft deep shaft at the Patience Lake mining site owned by the firm.

Meanwhile, a second United States firm, Duval Sulphur and Potash Co. of Carlsbad, N. M., with headquarters in Houston, has obtained a withdrawal permit and announced plans to begin drilling immediately on land 2 miles east of Saskatoon.

IN LATIN AMERICA

ARGENTINA

IAPI, Argentine Trade Promotion Institute, Argentina's official import-export body and exclusive buyer and seller of the country's leading mineral output, announced the following trade operations for the month of June 1955:

It bought up production of private mine operators for 120 metric tons beryllium and 54 tons wolframite. From small producers it also purchased 115 tons lead ore and 7 of mica. Exports during the same month were: 150 metric tons of wolframite, destined to the General Service Administration and valued at US$450,000. 30 tons mica, valued at US$26,000 were also exported, 70% of which went to the U. S. and the remainder to Italy. Of the 400 metric tons beryllium announced under IAPI operations for May, as having been shipped that month to the U. S., shipment of 200 tons were delayed and were actually delivered in June.

Most important announcement made in June by the Dirección General de Minería—the state Mining Administration—is discovery of two big deposits, reported unusually rich in molybdenum and manganese ores. First is situated in General Alvear, Mendoza province, an area which depends almost entirely on agriculture as its source of production.

The manganese ore deposit is located at 37 km from San Rafael in the same province, near the banks of the Atuel river. According to the Mining Administration, both deposits are of such importance that it has requested IAPI, the official trading agency, to include them in its list of sources of supply, in order to

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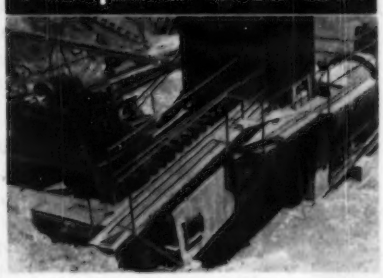

A number of southeastern rock phosphate producers report highly satisfactory performance from EAGLE LOG WASHERS. M. C. Boyle Phosphate Co., Centerville, Tenn., reports "we could not do the job without our Eagle Log Washer". New 48" washer, 24' or 30' long, handles up to 150 tons per hour . . . processes material up to 8" in dia. Sturdy tubular log shaft . . . replaceable corrugated paddles. For rock, ore, gravel the Eagle is outstanding for production, economy, low maintenance cost. Send for Catalog 55.

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Close to 3 yds. of ammonium sulphite handled by this 2¼-yd. MICHIGAN . . .

The bonus in the bucket pays for this machine fast!

Take another look at the bucket in the photograph. It shows a typical MICHIGAN* bucket-load, heaped-up well over the rated capacity of the bucket—nearly a 50% bonus. Translate this bonus into your daily production and you'll see why a MICHIGAN Tractor Shovel pays for itself fast: you simply move more material with a MICHIGAN.

Tremendous digging ability. Get the bucket blade into hard-to-dig material or under a heavy obstacle and "work" the bucket until you've got a heaping load. The two double acting bucket cylinders are actually powerful enough (if the blade is under an immovable object) to pull the back wheels off the ground! We'll match the MICHIGAN'S digging ability against any make or type of Tractor Shovel, bar none.

Low-level bucket action. You can roll the bucket back only a few inches off the ground—heaping bucket-loads even when the material is scattered only a few inches high. And you can carry the full load *low*—your driver can *see* where he's going, he doesn't have to travel *backwards*.

No clutch—faster cycles. There's no clutch pedal on a MICHIGAN. You can actually shift between Forward and Reverse *while moving:* simply push the hand-lever on the steering column—MICHIGAN'S power-shift transmission shifts instantly. Power-shifting saves time and energy every cycle. Your operators will say: "This sure beats riding a heavy-duty clutch all day!"

See it in action—on your own job. Write us and we'll arrange a demonstration. MICHIGANS are built to handle jobs too tough for other rubber-tired Tractor Shovels—*let us prove it*, without obligation. Write for details on the pay-as-you-go MICHIGAN Lease Plan—you can put these machines to work without laying out a penny of capital.

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Argentina *(Continued)*

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BOLIVIA

Bolivian Government has authorized the signature of a rental contract covering 15,000 hectares in the Alto Beni Region for a period of 25 years to the Southern Heater Corp. of the United States. Corporation is to exploit gold deposits of the region which includes the Challana, Coroico and Carlos concessions which formerly belonged to Aramayo mines before this concern was nationalized.

BRAZIL

Chamber of Deputies in the territory of Amapá (on northern border next to Guianas) approved a sweeping program to harness the water power of Paredão falls for a power plant which would supply the fast-developing area with 100,000 hp of electric power.

Plan has to be approved by the congress and the president, but lawmakers in Amapá believe they will get their power plant because of the increasing rate of industrial demand in the area around the mouth of the Amazon River.

The territory is beginning to produce manganese for export and it is hoped that the increasing sale of the ore will help pay off the debt incurred by the power construction. Engineers say that the area around the projected power plant will demand 15-million kwh by 1959. If the plant goes up, the Amapá bill provides the layout of an extensive industrial park for the area.

COSTA RICA

Analysis of sample ores brought for analysis late in July show ores containing up to 65% copper discovered in the Guanacaste area of Costa Rica in the northwest section.

Samples were brought in by a prospector working that area.

Preparations were being made early in August to make a detailed survey of the area where the ore was found. The existence of copper in Costa Rica has not been reported previously.

GUATEMALA

U. S.-owned Compania Minera de Huehuetenango in northern Guatemala is installing a lead and zinc mill representing an investment of an estimated $1-million. Export-Import Bank is participating to the extent of a $5-million loan.

Mine, near the city of Huehuetenango, has been opened for some years but difficulties encountered with the previous Communist-dominated government there forced a shut-down.

CHILE

After unwatering the old Cuevas mine in the copper district of Cabildo, Aconcagua province, its new owners have built a 50 tpd flotation mill which is running satisfactorily.

In 1954, Chile produced 1.57 million metric tons of natural nitrate which was completely sold in spite of the loss of the Egyptian market. Output was slightly larger than that of 1953 which amounted to 1.42-million tons. It is hoped that production may reach 2-million tons per year when Congress passes the bill which embodies the referendum approved by the representatives of the government and of the companies which will enable the producers to obtain a more real rate of exchange and thus to enlarge their plants.

Brimstone production by the steam autoclave process is again on the increase because of better prices within the internal market, 14,000 to 15,000 pesos per metric ton of the metalloid 99.5%. Output reached only 60,000 metric tons in 1954 when the installed capacity was 135,000 tons.

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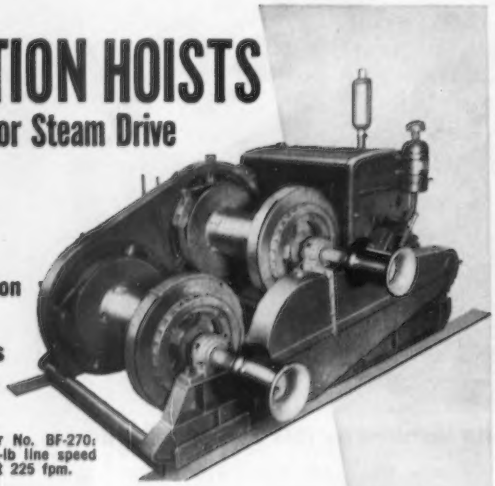

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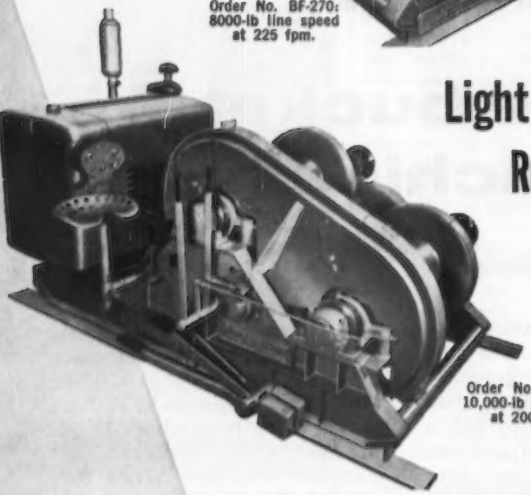

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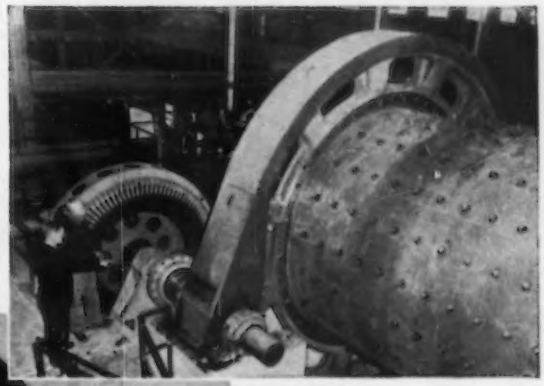

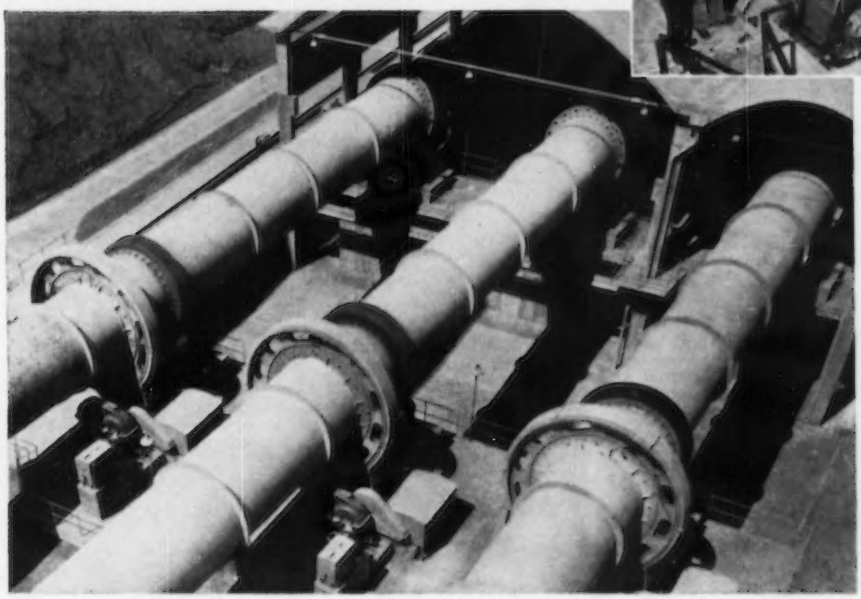

ABOVE: A 10 ½' x 12' ball mill with Falk helical gear and Steelflex coupling.

LEFT: 10' x 340' rotary kilns driven by Falk single helical gears, reducers and Steelflex couplings.

Are your costly gears wearing out? Falk Helical Gears wear in!

Operators and engineers know that the action of ever-present abrasive particles on gear teeth is the arch-enemy of gear performance and gear life. They know that, when spur gears are used, abrasion tends to damage the tooth profile (thus lessening the smoothness of power transmission)—and ultimately destroy the gear teeth.

The sure way to reduce costly gear damage to an absolute minimum is to use Falk Precision-Hobbed Helical Gears. On these, the gear teeth are on a helix; this means that all phases of profile contact ("rolling" and "sliding") exist at the same instant. Pressure and abrasive wear on "sliding" tooth surfaces are reduced, smooth transmission of power is assured, and *the life of gears and connected machinery is extended.* With several teeth sharing the load at all times, the teeth actually wear themselves *in,* instead of *out!*

You will find long-range economy in specifying "Gears by Falk" whenever you expand or revamp your facilities. Falk is *the manufacturer* best prepared to recommend and produce the exact helical gear—single or herringbone type—most suited to your application. Falk's leadership in precision gearing is recognized the world over.

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also, **write for Report 6170,** "Advantages of Helical Gearing."

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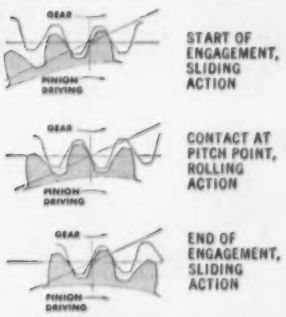
GEAR FACTS FOR ENGINEERS

As each spur gear tooth picks up the full load, the relative motion between the driving and driven tooth is a sliding action. As rotation continues, this motion becomes rolling at the pitch point, changing to sliding action again as the tooth advances toward disengagement.

PHASES OF INVOLUTE GEAR TOOTH ACTION



Helical gears have several teeth sharing the load. Teeth are simultaneously in all phases of contact across profiles, with contact starting at the tip of the teeth and extending obliquely to the base, thus reducing unit pressures. Also, portions which are rolling will limit the pressure exerted on portions which are going through sliding.

When abrasive materials contaminate the lubricant and get into the gear mesh, the more one can limit pressures in sliding areas, the less grinding action (hence wearing away) there will be.

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Chile *(Continued)*

The Callejas family, which already owns two copper flotation mills and two gold cyanide mills, plans to build another flotation mill in the Vallenar district to treat the dumps and fillings of the Fraguita, Quebradita and Labrar old copper mining camps.

Tamaya Co., a gold, mercury and copper producer with mines in Coquimbo and Aysen provinces, has been developing an entirely new copper mine in Aysen. Meanwhile the development in Las Chivas copper mine is progressing satisfactorily and plans are going ahead to put a small copper smelter at this latter mine which will consist of a blast furnace and a converter. Las Chivas orebody is a massive chalcopyrite-pyrrhotite ore running an average of 12% and will be smelted pyritically.

Braden is pushing ahead fast in its program to increase its mill capacity by 15% and the new sections should be in operation by the end of October 1955. Two new Symons short heads and 34 Utah vibrating screens are replacing two old 72-in. rolls and screens; 4 new 8x12 primary Marcy mills and two Dorr classifiers as well as 8 secondary Marcys and 4 Dorr classifiers are being installed and the necessary auxiliary machinery such as feeders, belt conveyors, elevators, etc. Capacity of the secondary bin will be increased from 21,500 to 26,200 short tons.

Hewitt-Robins, Inc., has received a contract from the Santa Barbara Mining Co. to build a complete storage and ship loading installation at the Port of Huasco, where iron ore will be transferred by conveyor to ships at the rate of 600 tons an hour.

MEXICO

Dowa Mining Co., Ltd., of Japan, has gained what reportedly is its first foothold in Mexico. Late in August the company was forming Dowa de Mexico, S.A., to reopen abandoned copper mines near Ayutla, Jalisco.

In all there were five small abandoned copper mines near Ayutla. In early September Dowa began cleaning out old drifts and crosscuts, and to block out ore. A 100-tpd mill is to be brought from Japan, and to be set up in time to begin production next June. Concentrates will be shipped to Japan for smelting and refining. It is hoped that eventually this mill will be expanded to 300-tpd.

Dowa's representatives reportedly are Yoshituru Suzuki, business manager, and Jiro Fugiwara, mining engineer.

Exploration of the first mine to be reopened was being undertaken by Joy air compressors and rock drills with feed legs.

Cía. Minera Victoria Eugenia, S.A., is building a 300-ton flotation mill on its Colorado mine near Chalchihuites, Zacatecas. Completion is expected next January.

Colorado mine, an old lead-zinc-silver property, worked up to 1914, has been under exploration by Vaupell y García, of Mexico City, for the past five years. Reserves are said to amount to 400,000 tons sulphide ores.

A vertical shaft has been extended 235 m below an outcropping. Cut and fill stoping will be carried out from the 100-m horizon. Concentrates will be trucked (10.5 miles) to a rail head at station Lo de Mana.

Fred Murphy, veteran mining engineer, designed the mill and is supervising construction.

Cía. Minera La Perla, S.A., which has a small mine called El Triunfo, 30 miles southwest of La Paz, Baja California's principal seaport, plans to begin production in late October.

El Triunfro is an old mine which had been worked for its gold, silver, lead and zinc, with small values in copper. La Perla is installing a Wemco heavy media separator plant and plans to begin reworking the old mine tailings before putting recovered minerals through its 70 to 100 tpd flotation mill. It is expected that top rate concentrates will be sent to the CIMOSA (Cía. Industrial y Minera Occidental, S.A.) smelter at Mazatlán.

It is known that workings at El Triunfo existed prior to 1880. Work reportedly stopped in about 1925. In 1949 Comisión Fomento Minera built the mill to work the mine tailings and also established a new small mine called Sin Rival. Subsequently this was reportedly turned over to private interests.

General manager for La Perla is Ing. Manuel Reynoso.

What may be the richest sulphur core ever drilled was announced by Gulf Sulphur Corp. which is nearing production on Mexico's Isthmus of Tehuantepec.

Walter H. Maddox, consulting geologist, said that in a well drilled to a depth of 1,297 ft, the bit bore through 695 ft of sulphur-bearing limestone. Maddox said that this assayed 27% sulphur and was the equivalent of 188 sulphur ft. This latest well was drilled as an offset to another well which equaled 178 sulphur ft, Maddox added.

By triangular computation, Gulf said that an additional 2,437,000 long tons were added to the company reserves.

Proven reserves on 75 acres of Gulf's 7,414-acre concessions now reportedly amount to 13,370,000 long tons.

VENEZUELA

Requests for bids on the multi-million dollar hydroelectric project on the Caroni River in Bolivar State were advertised Aug. 15, 1955, Dr. Silvio Gutierrez, development minister, has announced. Project will be tied in with the huge national steel mill to be built n...r Puerto Ordaz, site of U.S. Steel's iron ore shipping point.

According to Lancelot A. Fekete, the huge manganese deposits discovered between Imataca mountain range and the Caura river, east of the town of Upata in Bolivar state, may be among the richest

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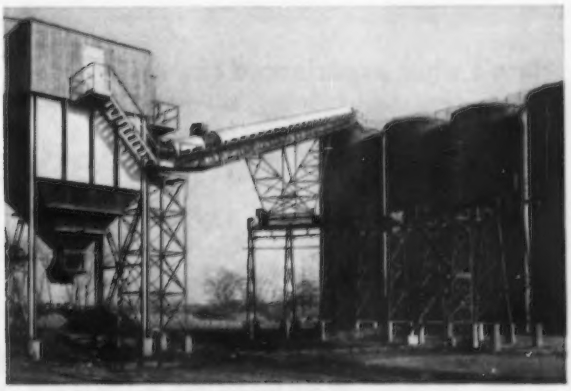
Over 4,300′ of Barber-Greene Belt Conveyors handle 45,000 to 55,000 tons of coal each month at the Sauceda mine in Palau, Mexico. These conveyors move the coal to the transfer bin for loading, to the stacker for stockpiling and reclaiming . . . or to the processing plant.



This 119′ Barber-Greene Stacker pivots on a curved track to deliver up to 250 tons per hour to any of five silos. Built for the Chicago Wilmington & Franklin Coal Company, this Barber-Greene installation has a capacity that can be quadrupled when required.

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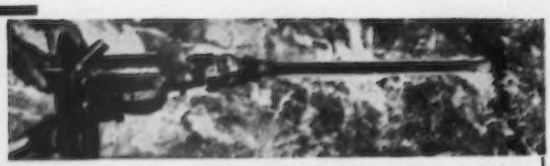

Roy McLeod, Asst. Mgr. Trout Mining Div., American Machine & Metals, Inc.

Drilling soft limestone and hard quartzite at the zinc, lead, silver and manganese producing Trout Mine*, Philipsburg, Mont., the profit-picture was improved by (1) using air-legs (2) drilling small holes (3) with job-fitted Intra-Set carbide tipped steel. They drill 6-ft. rounds consisting of 24 holes in a burn pattern, working a 5 x 7-ft. face. Stoper work is done with 1-in. Q.O. B & L drill steel and 1¾-in. Rok-Bits.® For details, contact B & L plant nearest you. Our tools for large, as well as small, hole drilling in Bulletin B-1. *Supplier Miller Machinery Co., Missoula, Mont.

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Venezuela *(Continued)*

in the world. Several million tons of high grade ore, assaying 28-55% manganese, are believed to be present.

Deposits on Lindero mountain contain grey ore running 42-55% metal. 2,000 tons are visible; 200,000 tons probable and over 1-million tons possible. Outcrops are covered with thick vegetation, which almost completely conceals the ground. Fekete, in a special report to the Ministry of Mines and Hydrocarbons, also stated that 3,000 tons of low grade ore (30-42%) are visible and the possible low grade may exceed 2-million tons.

On Guacuripia mountain the deposit is said to contain the highest grade of manganese ore known in Bolivar. Approximately 150,000 tons of 45-55% manganese ore are visible and the probable ore is estimated to run over 1-million tons. From El Resguardo to the El Palmar region, the geological formations are similar to those of Brazil and Africa's Gold Coast.

IN AUSTRALIA

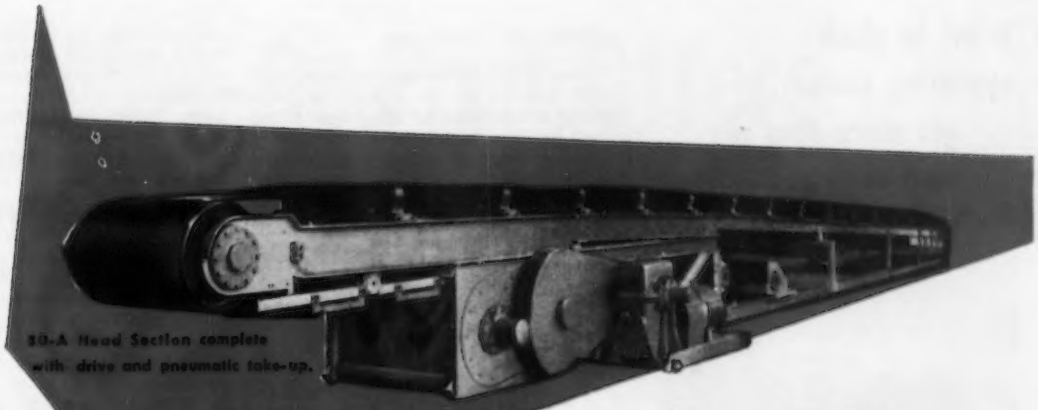
Decline in the mine output of several important materials is reported from New South Wales. Figures cover the first four months of 1955 as compared with 1954 and show a drop of 20% for copper, 31% for gold, 9% for sulphur and zinc and about 6% for lead and silver. Production of cadmium is also dropping.

Excellent results were obtained with a new Dutch machine introduced for assessing the value of alluvial mineral deposits. Machine is a Conrad Stork mechanical pit digger and portable alluvial testing unit. The machine will be mostly used for checking unusual (shingly) deposits and re-checking of results obtained by other methods.

From the Pilbara district in Western Australia, the Northern Mineral Syndicate reports a very satisfactory assay report on the first output of tin from its Spear Hill workings on the old Coogliegong field. Initial parcel of 6½ tons of concentrates assayed 76% tin. An average of 98% concentrates for the whole output attests the efficiency of the plant even at this early stage.

Entry of Atlas Corp. of U. S. into the Australian uranium prospecting field is expected to be followed by an increased range of exploration activities. Australian partner of Atlas, North Australian Uranium Corp. N. L., expects to accelerate the development of the deposits at Sleisbeck and on the South Alligator River Valley. Atlas and its associates will own 50% of all outstanding stock in the corporation.

Building of treatment plants on sites with big uranium ore reserves is expected to be accelerated as a result of the disclosure that Australian uranium oxide is worth about $22,400.00 a ton. Australian Ministry of Supply has ventured an opinion that the price will hold for at least 10 years.



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Loading Station with Impact Idlers mounted on 80-A frame.

The husky head section incorporates a tandem drive which provides maximum contact with drive pulleys and permits operation with a minimum slack tension. Proper slack tension is automatically maintained by a pneumatic take-up. Bores for drive pulley bearings are machined in alignment so that assembly can be made only with shafts parallel and gears properly meshed. The head is built for motor drives up to 160 HP and belt speeds up to 600 FPM.

The sturdy 80-A frame is adaptable to 30", 36", 42" and 48" belts and 4", 5" or 6" diameter idler rolls. The frame permits a choice from a variety of standard idlers.

If your problem is heavy haulage, better haul it correctly from the start—on Jeffrey's heavy-duty 80-A.

Planning on replacement or modernization of parts of your present belt conveyors? No matter what the make, Jeffrey can supply Head Sections, Power Units, Tail Sections, Intermediate Sections, Idlers, Impact Idlers, Loading Stations with Impact Idlers, Horizontal Pneumatic Takeups and Speed Responsive Switches. Let us quote on these units.

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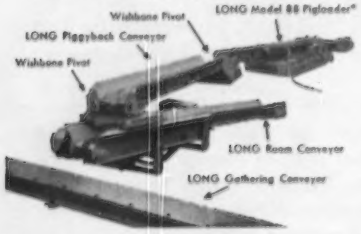

The receiving end of the Piggyback Conveyor is attached to the Pigloader Loading Machine and follows it as it moves. Thus, the operator can devote his full attention to loading. Wishbone pivots make possible continuous haulage at 90° angle breakthroughs.

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Australia *(Continued)*

Prospecting at El Sharana field shows payable uranium ore to a depth of 70 ft under overburden and the length of the lode has now been proved to be 210 ft. Average assay of eleven holes showed 0.5% uranium oxide value. Pattern drilling is being carried out on a closely spaced grid to determine the horizontal extent of ore beneath the overburden. Additional prospects are worth exploration by an airborne scintillometer survey and geological mapping. Geologists and exploration crew were also despatched to the Kimberley field in North Western Australia to begin exploration of the recently discovered uranium lodes.

Northern Hercules N.L. is planning to develop its pyrite reserves to provide sulphur for use in a uranium treatment plant which may be erected near its mine close to the South Alligator River area. In any case Hercules will need to treat sulphide ore to extract its gold so that the decision seems to be a logical one. Gold values of up to 7 oz on the 112-ft level at No. 3 shaft were reported and it is expected that large scale production will start in October.

New Broken Hill Consolidated N.L. released figures covering the first six months of 1955 (comparative period of 1954 in brackets). Ore treated rose from 232,109 to 248,024 tons for 20,472 (19,963) of lead, 63,586 (61,385) tons of zinc concentrates assaying 51.0 (51.8%) zinc and 389,403 oz of silver (386,977). Similar figures for another large Australian company, Zinc Corp., are: ore treated 308,786 (285,701) tons, containing 39,418 (39,734) tons of lead, 52,137 (53,237) tons of zinc concentrates assaying 52.7% (unchanged) zinc and 860,323 oz of silver (880,403).

French company has secured a contract with Australian steel mills for the delivery of 160,000 tons of iron ore annually for the next three years. The company, Le Nickel, operates mines in New Caledonia and has formed a new firm which will use its own vessels to ship the major part of the ore to Australia.

Under contract, Australian importers have the option of increasing iron ore imports from New Caledonia to 300,000 tons a year after three years.

IN AFRICA

World's richest major gold mine, West Driefontein, west of Johannesburg, showed a working profit of $3.55-million for the quarter ended June 30, from milling 208,000 tons of ore. Yield per ton milled was 15.305 dwts. Development showed 100% payability with an average value of 861 in.-dwt. The ore reserve at the end of June was estimated at 1,096,000 tons averaging 16.5 dwts. over 42 in.

Rhodesian Selection Trust has formed a new company, Rhodesian Selection Trust Exploration. Company is to examine any mining propositions, not necessarily copper, submitted for its consideration from within the Central African federation. Its activities will not be associated with the long-term prospecting program at present being undertaken by R.S.T. over large areas in Northern Rhodesia, but will deal with proposals made by individuals or organizations outside R.S.T.'s present fields of prospecting.

Water consumption by the new Free State gold mines, particularly as a result of uranium production has outstripped earlier estimates. Present capacity of the supply plant is 16-million gal a day but will be at least 54-million gal by 1961. At present 21- and 32-in. pipes are carrying water over 30 miles. Work is now being pushed ahead to install an additional 45-in. pipeline.

High speed development, high percentage payability and continuing good values are reported by most of the Free State gold mines for the June quarter. At Free State Geduld, total development was 21,456 ft; average payability 93.5% and average value 706 in.-dwts. In one, 100% pay was obtained with an average value of 1,733 in.-dwts. President Brand did 22,136 ft of development and got 91.68% pay averaging 1,143 in.-dwts. Gold profits at this mine were over $2.2-million for the three months and $155,000 were earned from uranium recovery in the same period.

Rhodesian Selection Trust's new copper mine, Chibuluma, on the Copperbelt, is scheduled to come into production at the end of the year. The orebody is smaller than those at present being worked by other mines, but it is likely to be the richest. Indicated reserves are 7,300,000 tons of ore running 5.23% copper and 0.25% cobalt. Production is estimated at 16,000 long tons of copper and 500,000 lb of cobalt a year. The concentrator plant will treat 40,000 tons of ore a month.

Largest fan of its type in the world and the biggest ventilating unit on the Copperbelt has been commissioned at Mufulira Copper Mine. A spingle-type unit, it has a capacity of 1,000,000 cfm against a 5-in. static water gage. It is 214 in. in diameter and stands 57 ft above the shaft collar, weighs 80½ tons and is equipped with a 1,150-hp motor.

Zinc production at Rhodesia Broken Hill Development Co. for the second quarter of this year was 7,075 long tons compared with 6,975 for the first three months. Lead production was 4,700 long tons compared with 2,850 long tons for the first quarter.

Deposit of more than 3-million tons of calcium phosphate has been found in the Lake Chilwa district of Nyasaland. Deposits can be quarried and sampling so far indicates that the quality is better than the formations at present being worked in Southern Rhodesia.

A team of mining engineers from Sweden is at present prospecting for copper in Angola and Mozambique. In terms of an agreement with the Portuguese Government, they have been granted a concession to work any possible ore finds.

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IN EUROPE

NORWAY

The uranium-searching fever is expected to grip Norwegians this Fall when the state's exclusive rights to all uranium deposits expire.

The "Uranium Law" of 1946, which gave the state sole ownership of uranium finds, is to be reviewed in late Summer, and observers say it is not likely to be extended.

This law has caused all Norwegians who might have uranium deposits on their land to keep the fact a secret in fear the state would appropriate their land. This has limited the exploration of Norway's uranium deposits.

During the past months public lectures were held instructing interested prospectors in the technique of uranium prospecting and in the use of the Geiger counter. Sales of Geiger counters have been increasing.

AUSTRIA

The first domestically built blast furnace is at present under construction at the Lenin Metallurgical Works of Dimitrovo. Unit is said to be of 400 tons capacity.

Production of high-temperature resistant steel was possible for the first time in Bulgaria in the furnace department of the Electrometal undertaking of Sofia. This feat will gradually eliminate imports of this steel quality say officials.

First Bulgarian lead-zinc mill is at present under construction in the eastern part of the Rhodope Mountains. It is planned to start production still in 1955, to process local ores to especially high-grade zinc.

POLAND

Lenin Iron and Steel Combine (Nova Huta) of Krakow put into operation the second open-hearth furnace of 320 metric tons charging capacity during May 1955. To meet all requirements, Polish coal business is now managed by Soviet engineers to drastically boost yield. 11 iron ore mines are at present under construction, especially in the Leczyca district, of which 6 already produce. During the next 5 years, 11 more iron ore mines are planned. The capacity of each of the new mines is claimed to be 4 times the output of an average production of an old mine.

A new flotation plant for iron ores was handed over to production workers late in May 1955. The unit, located in Poraj (near Czestochova) works fully automatic. New units are already under construction near Sabinow, another near Dzbov (near Czestochova). Both these units will produce in 1955.

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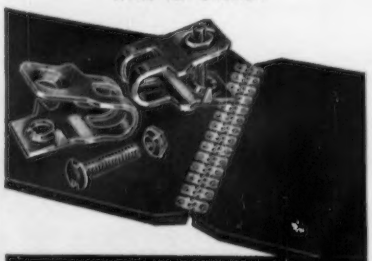

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Poland *(Continued)*

The highest located Polish mine, the quartz mine of Bialy Kamien, 3200 feet above the sea-level, yields raw material containing 99.77% pure pyrite. Daily production level rests at about 70 metric tons. In the end phases of enlargement, a multiple of the present production is expected. Still, imports will remain necessary.

Extensive deposits of sulphur have been discovered in Poland. After the first sensational report concerning the discovery of small sulphur deposits late in 1953 no news about sulphur reached the West until May 1955 when an extensive report said Polish geologists up to 1952 did not know more sulphur deposit than the two modestly yielding ones of Swoszovice and Czarkovy. All sulphur for the chemical industry was won from anhydrite and pyrites after costly processing work.

First indication of extensive sulphur deposits came in the fall of 1953 when geologists found traces of sulphur in the Sandomierz area. Now, in the first half of 1955 Poland is certain to possess the largest sulphur deposits, and the third largest in the world—after the United States and South America.

Professor Stanislav Pavlovski is credited with the work leading to the discovery. Ever since these first two test wells drilled, the team under Pavlovski hit sulphur deposits in the closer surrounding of the first findings. At the beginning of 1954 a "large area" was explored, and all test wells showed sulphur. The Polish sulphur is of sedimentary origin, and stems from the period of miocene sea deposits. At the beginning of 1955 all further search activities were temporarily halted to give the mining experts a chance to study the location of the projected mines.

Deposits are said to be "large enough to last for generations" and to "cover the requirements of the Polish chemical industry completely." The Polish sulphur is characterized by the complete absence of arsenic and selen, the ore contains sulphur of the best sediment-type properties.

Poland points at the increased demand for sulphur in the world: During the past 50 years consumption of sulphur has experienced a 1,000% increase. Poland indicated that it may later ship sulphur to Great Britain, Germany, and France, where an acute shortage of sulphur exists.

IN THE NEAR EAST

LEBANON

Three leading papers reported that a group of Lebanese engineers has informed the government that uranium ore has been found around the Dahr El Baidar pass, near the Beirut-Damascus road. Tests indicate the definite presence of raidoactive material in the samples of earth taken from the site of the alleged discovery.

MOROCCO

The world's second producer of phosphate rock, awoke from a week-end of rebellion to find its principle installations at Khouribga placed out of operation by scientific sabotage. In 1954, Morocco produced a record quantity of 5-million tons of phosphate rock; 3,400,-000 of this production came from the installations at Khouribga. Furthermore, Khouribga produces the best grade of 75% tricalcium phosphate, whereas the other major producing center at Louis Gentil produces a 70% grade. Reportedly the world's largest single phosphate installation, Khouribga has produced 45-million tons of phosphate rock since 1922. Reserves are estimated at 150 million tons.

Destruction was carried out with scientific precision. As a consequence it is doubtful whether Khouribga will be able to ship any phosphate rock for two months and depending upon the availability of replacement equipment it will be 6 months before anything like normal production can be expected. Damage of the installations, which employed 9,000 workers, is estimated between $3 and $4-million.

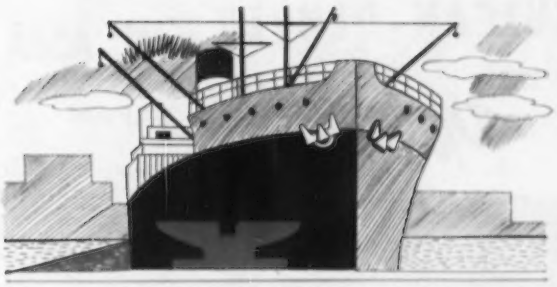
Special teams of experts of the Office Cherifien des Phosphates, the Government corporation which owns a monopoly of the phosphate deposits in the country, are convinced that the sabotage was carried out by persons fully acquainted with the operation at Khouribga and by persons technically qualified to select the crucial equipment in the installation. Principal conveyor for loading hopper cars was blown up. Several diesel locomotives, valued at half a million dollars, have been placed out of use. A new drying plant, valued a half a million dollars, which was still in a state of trial, was also destroyed.

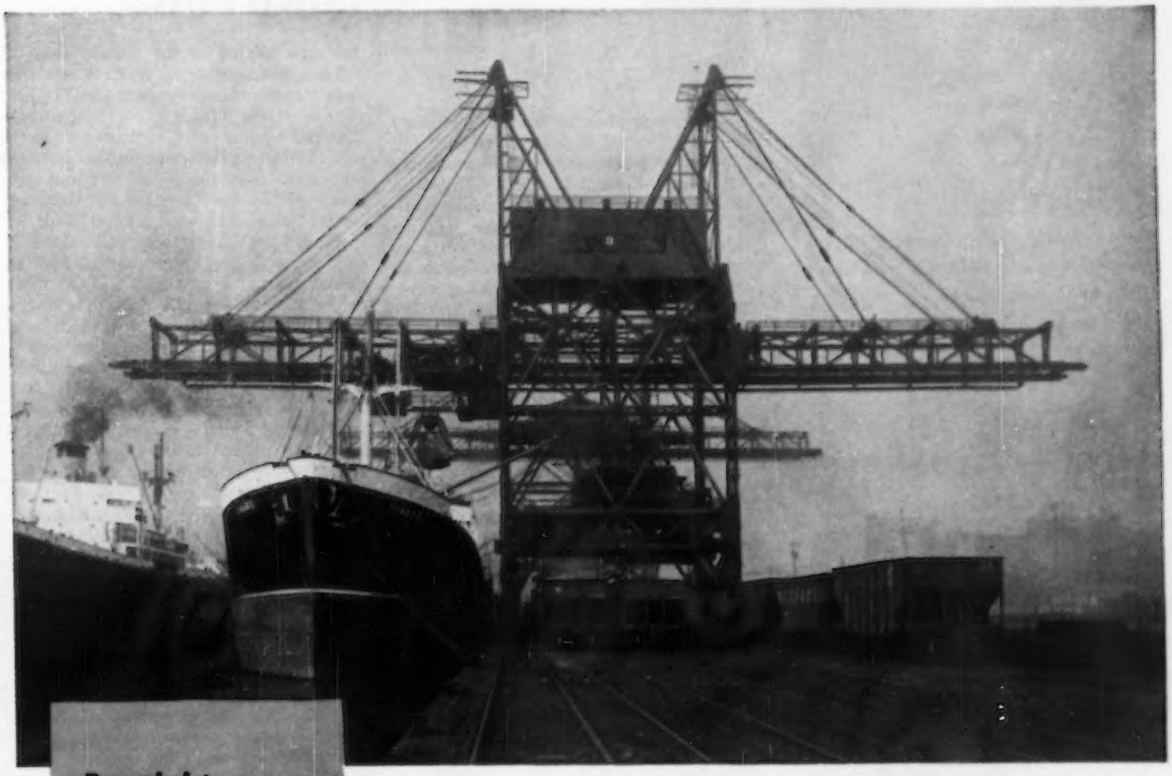
Laboratories, offices, and a half a million mine props were burnt to cinders. The scientific destruction of the Khouribga installations, the attack at the iron mine at Ait Amar, Morocco's principal mine producing 300,000 tons per year, in which 19 Europeans were massacred and attacks on nearby antimony mines, all gave evidence that one of the objective of the rioters was the industrial productivity in this important mining area. (See June *E&MJ*, Vol. 136, No. 6, page 198 for picture and story of the plant.)

EGYPT

In the desert near Heluan, 30 km south of Cairo, a metallurgical plant with an initial capacity of 265,000 tons raw steel per year will be established. Construction work started the end of July and is scheduled to be completed within two years. After three years, capacity will top 500,000 tons.

you can't show a profit while the cargo's in the boat





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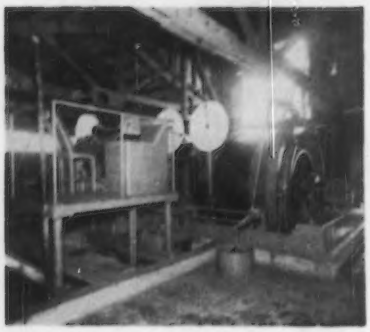

Photo shows Vulcan-Denver Double Drum Mine Hoist, 30,000 lb. rope pull, at the Philippine Iron Mines. This company also has a Vulcan-Denver Double Drum Service Hoist, 8,000 lb. rope pull.

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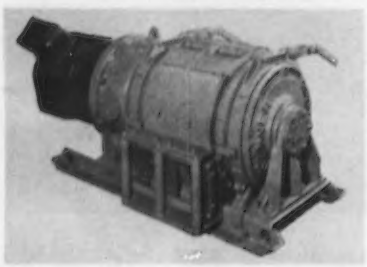

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IN ASIA

JAPAN

Shinton Jitsugyo Company will import 20 kilograms of platinum from the Soviet Union.

Scheduled to arrive in August was a shipment of 15 kg of platinum contracted for some time ago by the Okura Shoji Co.

INDIA

Russian steel plant at Bhilai in Madhya Pradesh (Central India) will go into full production in December 1959 according to Nikolai Kratenko, chief engineer in charge of construction. Kratenko estimates that two blast furnaces will be ready by the end of 1958. When it goes into full production, Bhilai will have an output of 720,000 tons of finished steel, 200,000 tons of iron plates and a 100,000 tons of pig iron.

The Russian engineer and five of his colleagues now living at the plant site say that the Indo-Russian plant would be built along the lines of the Rastoroi unit near Thilisi in the Urals, which Premier Nehru visited recently.

The Russian team's production specialist has come out from Anshan, China. Construction deadlines now are resolving themselves into something of a race between the Russians and the Germans. The latter have a head start but they are slower off the mark and the negotiations between New Delhi and Krupps took a long time getting wound up. Meanwhile the British still are processing a preliminary report for the third steel plant, possibly at Durgapur in West Bengal, while Tatas await formal sanction of their $62-million Import-Export Bank loan.

MALAYA

Although torbenite has been discovered in an abandoned tin mine in the mountainous spine of Malaya, officials are not allowed to give out any information on prospects for uranium. Torbenite was also known to have existed before the war (when it was not at a premium) in two other tin mines in the same area.

One application to prospect has been made to the Government, but due to terrorist activities in this dense jungle, security clearance has not been given.

From the annual report of the Director of Geological Surveys for 1949, it appears that uranium ore might be recovered from quartz veins and stringers carrying cassiterite, as a by product of tin mining in some desposits in the state of Selangor. Although the ore may occur in pegmatite dikes traversing grante the report indicates the primary uraninite might be found only at some depth below the weathered zone carrying torbenite and autuntite, which in Malaya extends to a length well over 140 ft.

Preparations are under way for a geological survey to be carried out by the government, and if and when specific information is available jungle prospecting should become a more practical proposition.

IN THE PHILIPPINES

Tonnage treated at the Toledo mill of Atlas Consolidated M. & D. Corp. has risen steadily month by month to 111,116 tons in June. Grade of ore milled has declined slightly to 0.85% copper as a result of some oxide ore being mixed with the sulphides at the top of the orebody. It is expected this condition will continue for several months until the top 40 or 50 ft of the orebody is removed. During June the low heads were caused by this partially leached material. In addition to ore sent to the mill Atlas has stockpiled over 250,000 tons of oxide ore which will be treated by heap leaching.

During June, 2242 tons of concentrates were produced grading 23.1% copper and 0.13 oz gold per ton. All concentrates were sent to Japan for smelting. Copper shipments in June were valued at $425,000. In July 1,000 tons of concentrates are scheduled to go to the Tacoma smelter, while 3,000 tons, containing 1.3 million lb of copper and 450 oz gold will be sent to Japan.

Chromite deposits in Zambales, Palawan, Camarines Sur and Dinagot Island will be systematically surveyed by two American geologists, Dr. J. David Cerkel and Dr. J. Webb Peoples in cooperation with the Philippine Bureau of Mines.

Jesus S. Cabarrus, president of Acoje Mining Co., has confirmed the signing of a barter agreement by his company with the U. S. Commodity Credit Corp. to ship 65,000 tons of chromite concentrates in exchange for U. S. surplus agricultural products. Such shipments began in August and extend into June 1956. About 30,000 tons of concentrates are stockpiled at the company's pier in Santa Cruz, Zambales, which will be loaded when boats arrive. Chromite ore reserves were reported at 1,696,000 tons at the first of the year. About 700 men are normally employed at the mine.

Atlas Consolidated Mining and Development Co. has completed arrangements for the first sale of copper concentrates in the United States, it was announced by Colonel Andres Soriano, president.

The 400-ton concentrating plant, located in Cebu, Philippines, is delivering a shipment of 960 tons of copper concentrates to the American Smelting and Refining Co. in Tacoma, Washington.

Previously, Atlas had shipped its entire output to Mitsubishi Metal Mining Co. Ltd. in Japan. Colonel Soriano previously announced half of the copper concentrate would go to Japan, with the rest available on the world market.

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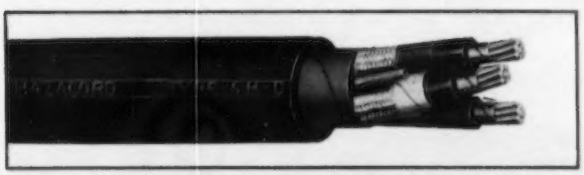

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VETERAN PIT of Kennecott Copper Corp. is being cleared at top speed, ore is being moved. Liberty pit (right background) is considered largest operation in eastern Nevada, with the Veteran now rated second. Veteran holds some 20-million tons.

Kennecott, Coppermines Work on New Pits

BULLDOZER ASSIST helps scraper move along floor of Kennecott's Veteran pit. Story of new development plans for the Veteran and the new Tripp pit starts on p 72.

FOURTEEN EUCLIDS were recently purchased by Consolidated Coppermines Corp. for action in the Tripp pit. Lineup was staged on delivery date, trucks are now in use.

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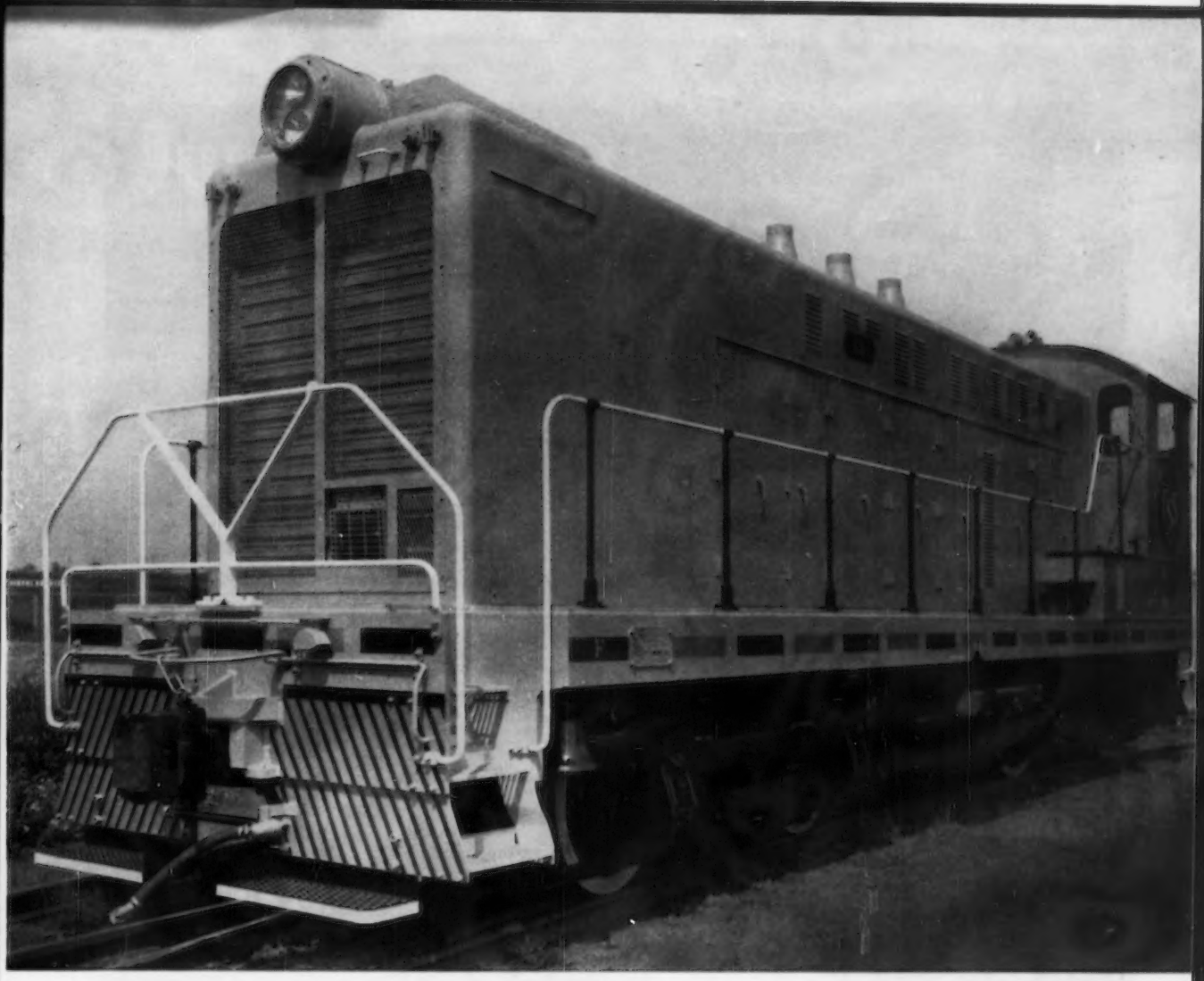

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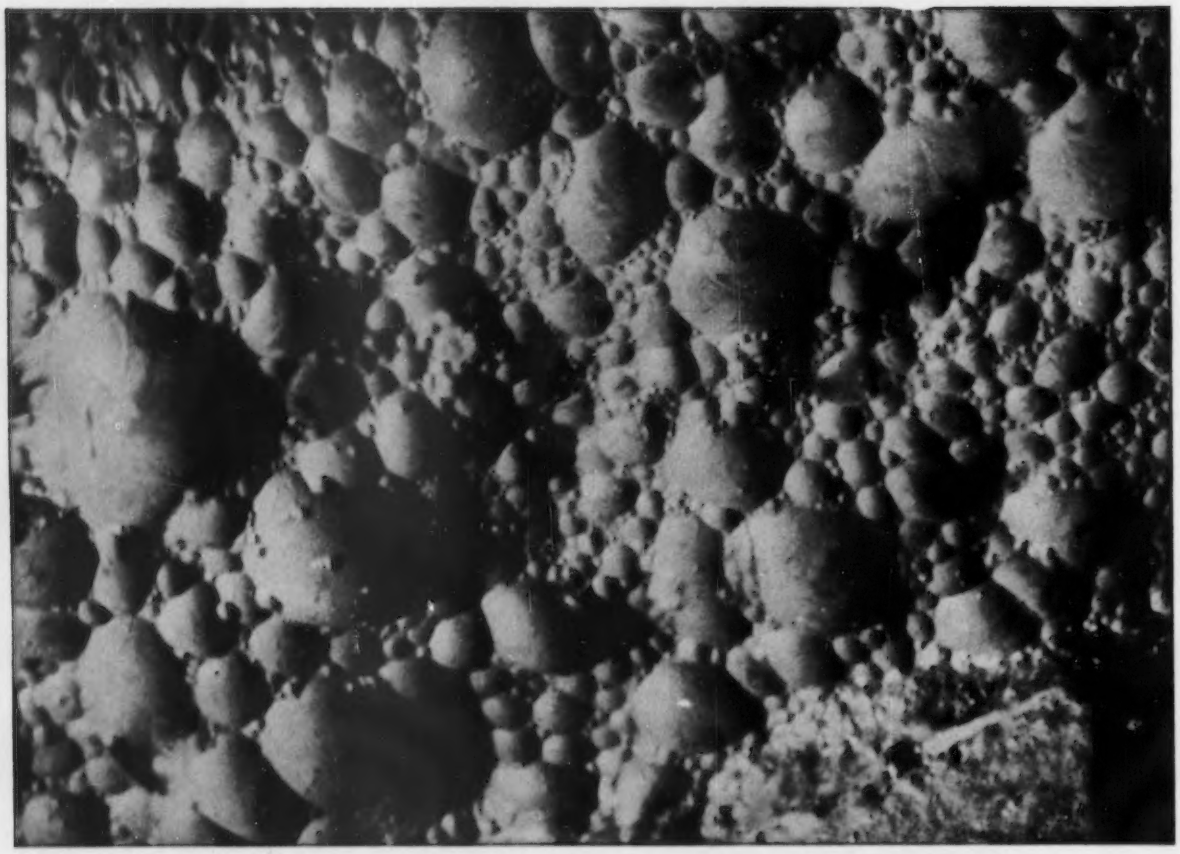

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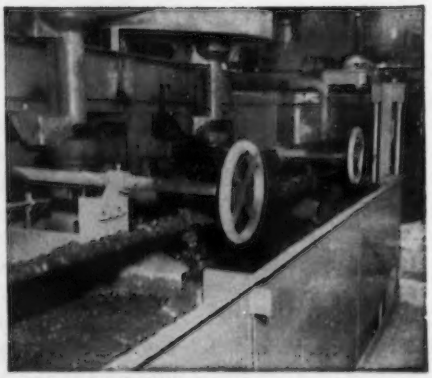

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Crushing Life Increased 14 Times *by* **Hard-Facing**

The hard-faced rolls on this rock-crusher mill have been in constant operation for six years. During this time, the rolls have been pulverizing such abrasive materials as ferro-alloys, ore, dolomite, feldspar, rock, sand, and clay used for making brick. Unprotected rolls, performing the same operations, had to be replaced every four or five months.

The serrated roll shown at the right in the photograph is the roughing roll used for initial grinding or milling. The smoother roll, at the left, is a finishing roll used to grind the abrasive materials into a powder. Both rolls were hard-faced with HAYNES STELLITE alloy by the metallic-arc process to protect them from abrasion.

There are 14 HAYNES alloys . . . each developed to resist certain conditions of wear. Some of these alloys are hard and abrasion-resistant, some are tough enough to stand up under heavy impact . . . others resist corrosion, erosion, or heat. Use them to protect bull-dozer blades, dipper bucket teeth, sheepsfoot tampers, tractor rollers and other metal parts exposed to wear.

Your dealer carries a complete line of HAYNES hard-facing rods. Ask him for our descriptive literature. If you don't know the location of your local dealer, write to Haynes Stellite Company, a Division of Union Carbide and Carbon Corporation, Kokomo, Indiana, for full details.

See... | Your local Haynes Stellite Dealer

— or —

Write... | to Haynes Stellite Company

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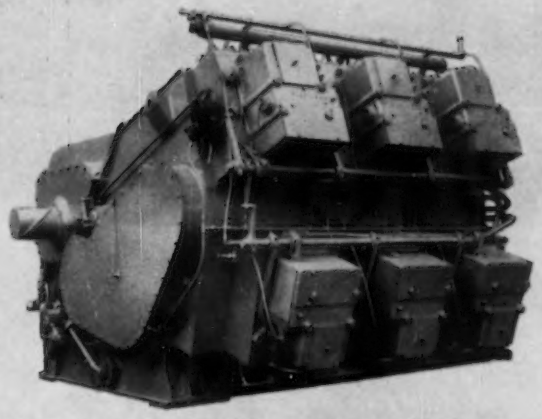
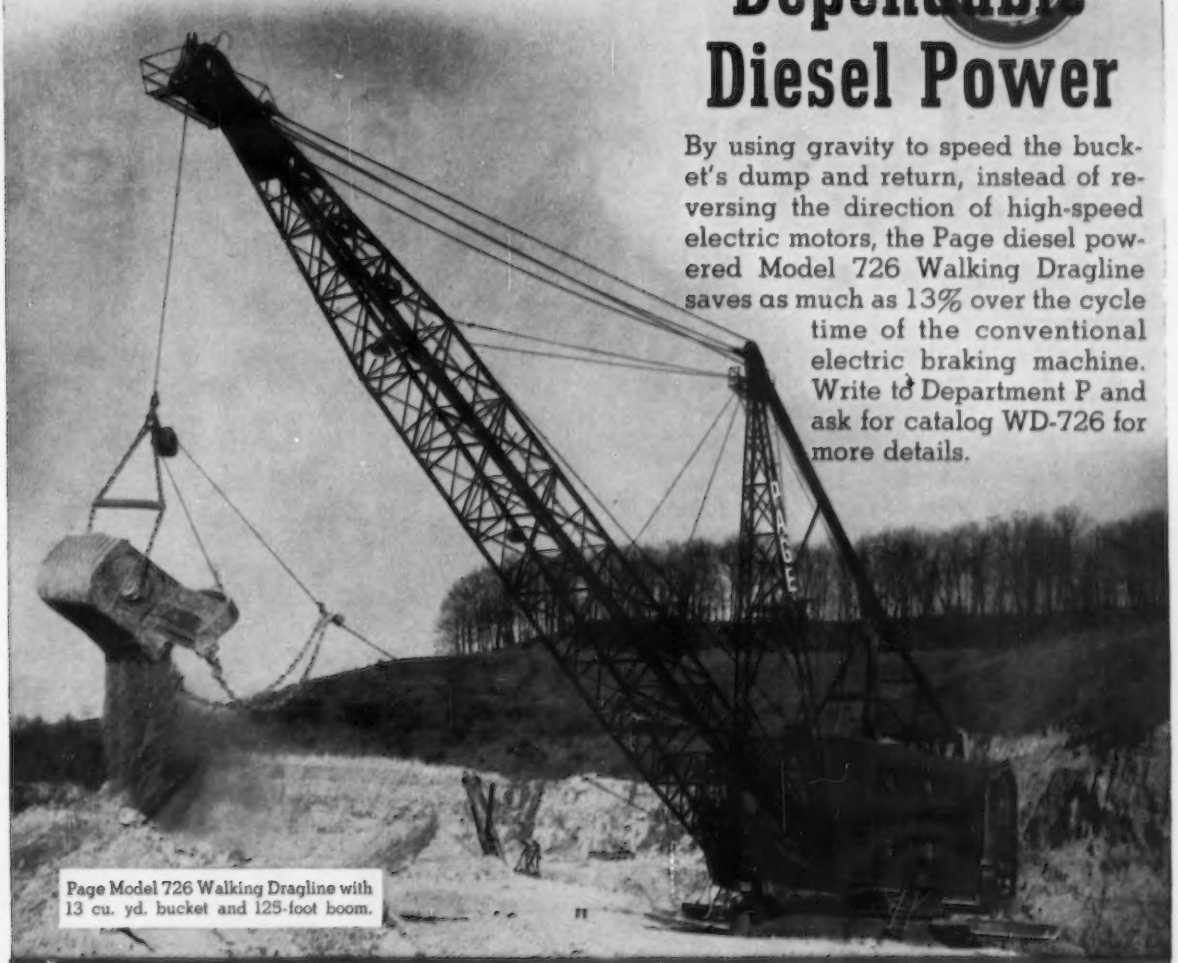


Page Engineering Company custom builds the new V-type, Horizontal Diesel Engine, shown at left, in order to allow the use of larger, more economical, draglines of capacities up to 20 cu. yds. Like the time-tested Page inline diesel, the V-type takes advantage of medium speed, parts interchangeability and complete accessibility of all moving parts to insure economy of operation and low maintenance costs.

Reduce Cycle Time with—Page Dependable Diesel Power

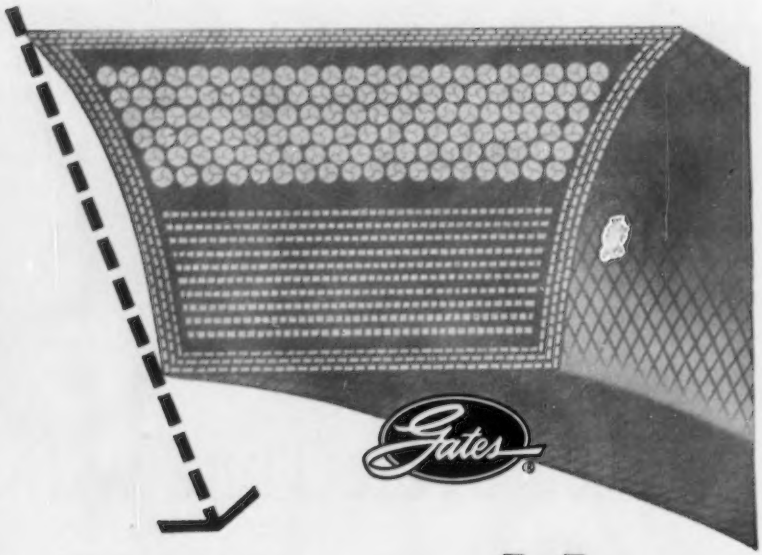
By using gravity to speed the bucket's dump and return, instead of reversing the direction of high-speed electric motors, the Page diesel powered Model 726 Walking Dragline saves as much as 13% over the cycle time of the conventional electric braking machine. Write to Department P and ask for catalog WD-726 for more details.



Page Model 726 Walking Dragline with 13 cu. yd. bucket and 125-foot boom.

· PAGE ENGINEERING COMPANY ·
CLEARING POST OFFICE CHICAGO 38, ILLINOIS

Shock and vibration are absorbed by this Gates Vulco Rope Drive on the ball mill in a New York rock crushing plant, saving over $600 a year in maintenance costs. Management gives credit to the resiliency of the Gates Vulco Ropes and to their concave sides for the many years of dependable service they have given.



concave sides lengthen V-belt life ...cut costs

Hundreds of plants that keep track of V-belt drive costs know this: Gates Vulco Ropes . . . the V-belts with *concave sides*...wear much longer and *cost less per year of service.*

Here is the interesting reason why:

When a Gates V-belt bends around the sheave, the *precisely-engineered* concave sides (Fig. 1) fill out and become straight. Thus the sides of the belt make full, uniform contact with the pulley (Fig 1-A).

Naturally, uniform contact distributes the wear *evenly.* And *even* wear means *longer* wear.

Longer wear saves not only on replacement costs; it also saves the cost of down-time... keeps equipment producing.

Simpie test proves value of concave sides

Take a straight-sided V-belt (Fig. 2) and bend it. Feel the sidewalls of the belt bulge out as the belt bends. You see immediately that the bulging sides prevent uniform contact with the pulley (Fig. 2-A). Uneven contact causes faster wear...increases your drive replacement costs.

Let the cost-saving longer life of Gates Vulco Ropes contribute to *your* profits. Specify Gates Vulco Ropes—the V-belts with concave sides (U.S. Patent 1813698). The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-belts.*

Gates Engineering Offices and Distributor Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA-540

GATES VULCO ROPE DRIVES

REMINGTON INDUSTRIAL GUN Cuts $85.00 job to $9.50 at quarry

"It used to cost us about $85 each time we had to remove overhanging rocks from our quarry—now with a Remington Industrial Gun we do the whole job for $9.50." That's the report from a zinc mine in Alabama.

Savings like this are common. The Remington Industrial Gun saves hours of hazardous work . . . can be aimed, loaded and fired in seconds. Mount it on a truck, a tripod or a mobile chassis. Set it up in any part of your mine or quarry. You'll find real versatility in this fast, safe way of removing obstructions. The U.S. Bureau of Mines, for example, has used it for dislodging large icicles at distances *up to 200 yards!*

BEST WAY TO REMOVE KILN RINGS, TOO. A few well-placed shots with the Remington Industrial Gun loosen rings, cause them to fall when kiln is rotated. Minimum downtime! Big gains in production!

REMINGTON INDUSTRIAL SHELLS have tremendous smashing power. They're loaded with a powerful 3-ounce lead projectile that develops 7,475 foot-pounds' muzzle energy.

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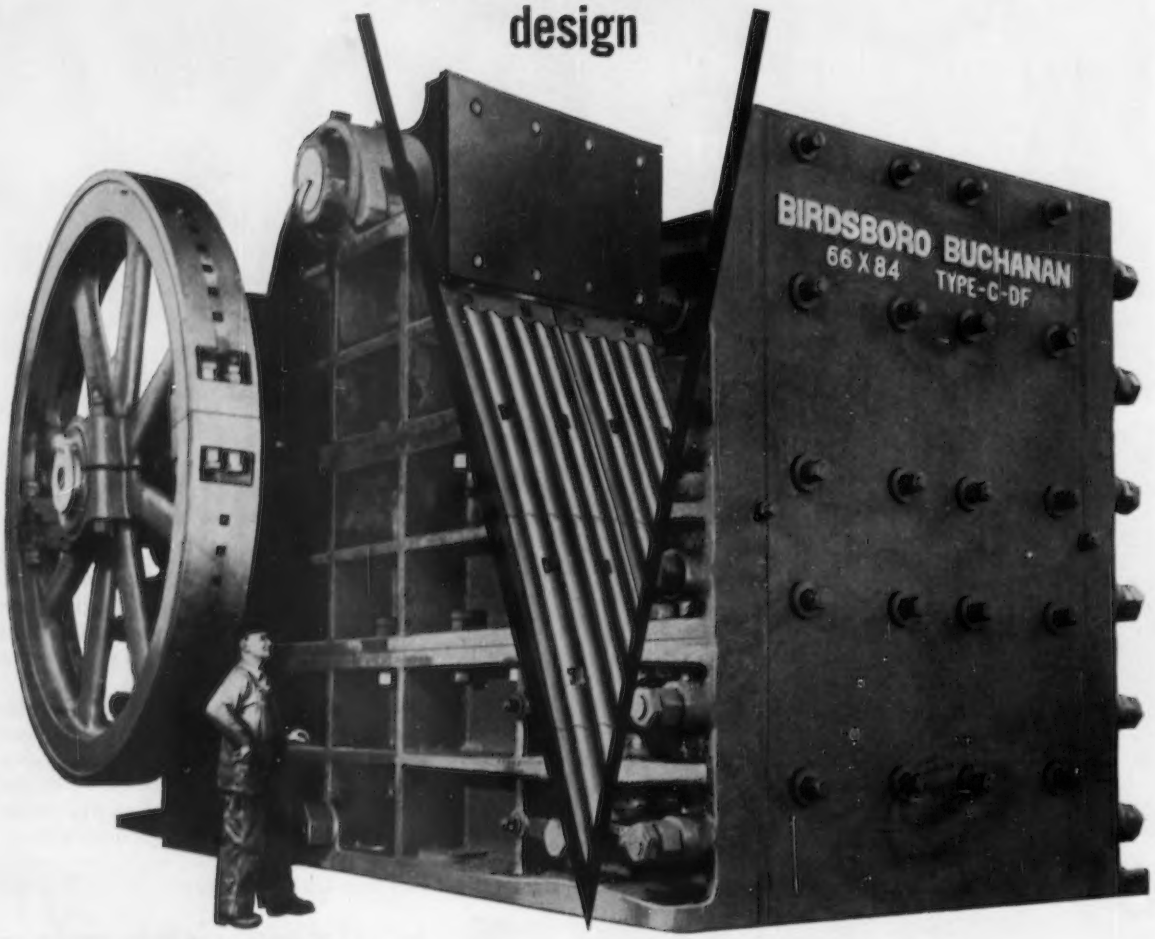

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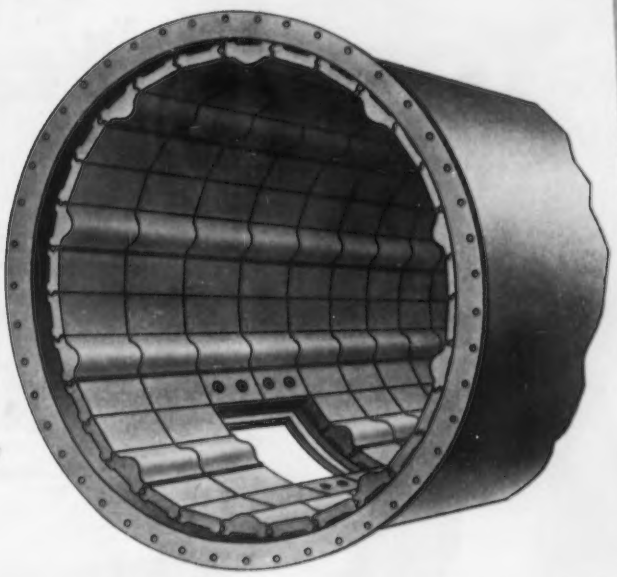
B&W Universal Liner Plates

Raise Performance, Lower Costs



PATENT APPLIED FOR

The new B&W Tube Mill Liners have advantages that mean reduced costs in capital, time and labor.

Cost per ton of material ground is reduced, for the practical reasons listed below. Check them—you may find that one, or a combination, of these qualities will solve your existing problems.

- Lower Initial Costs—No pattern and chiller costs —the result of standardization.
- Longer life of liners—Uniform wear will result from better quality control on a mass production casting, utilizing permanent molds. Size is ideal for uniform chill and heat-treatment.
- Longer life for different applications can be realized by a selection of proper materials. This design lends itself to either chilled irons or wear steels.
- Direct labor cost and the "down-time" to install the liners are reduced. Castings are easily handled due to small size and weight. Less fatigue of workers. No cranes needed to handle lightweight liner castings.
- Cost reduced for storage space. Minimum storage space required as small castings "stack" easily. Records simplified with one design of casting interchangeable for all size mills.
- Saves money on liner inventory. One design fits all sizes of mills, permitting standardization. Quicker unloading and storage possible.
- Savings in breakage claims and delays for replacements. Hard brittle irons are frequently broken in shipment when large castings are used. Small castings are rugged and almost impossible to break by handling.
- Savings in determining most efficient wear pattern. Same castings will produce wear profiles consisting of all lifter ribs, all flats or combination of both, including straight or spiralled lifter ribs. Straight or staggered circumferential joints can be used.

Liners are supplied in two nominal thicknesses, 1½″ and 3″ with 1½″ high lifters. Castings are 6″ wide x 12″ long. Positive seating of small castings on mill shell means less breakage of castings under operating conditions. For additional information on B&W Universal Tube Mill Liner Plates, write The Babcock & Wilcox Company, Process Equipment Dept., Barberton, Ohio.

BABCOCK & WILCOX

BOILER DIVISION

S-442

You a target?

Let's face it . . . we're all targets!

If your plant is not ready with a disaster plan, better act now. There's not a single American plant that's out of range of an intercontinental bomber—and fires, floods, tornadoes or explosions can kill you just as dead as an atom bomb.

It costs next to nothing to take a few simple steps which may save hundreds of lives. Here they are. Check them off today.

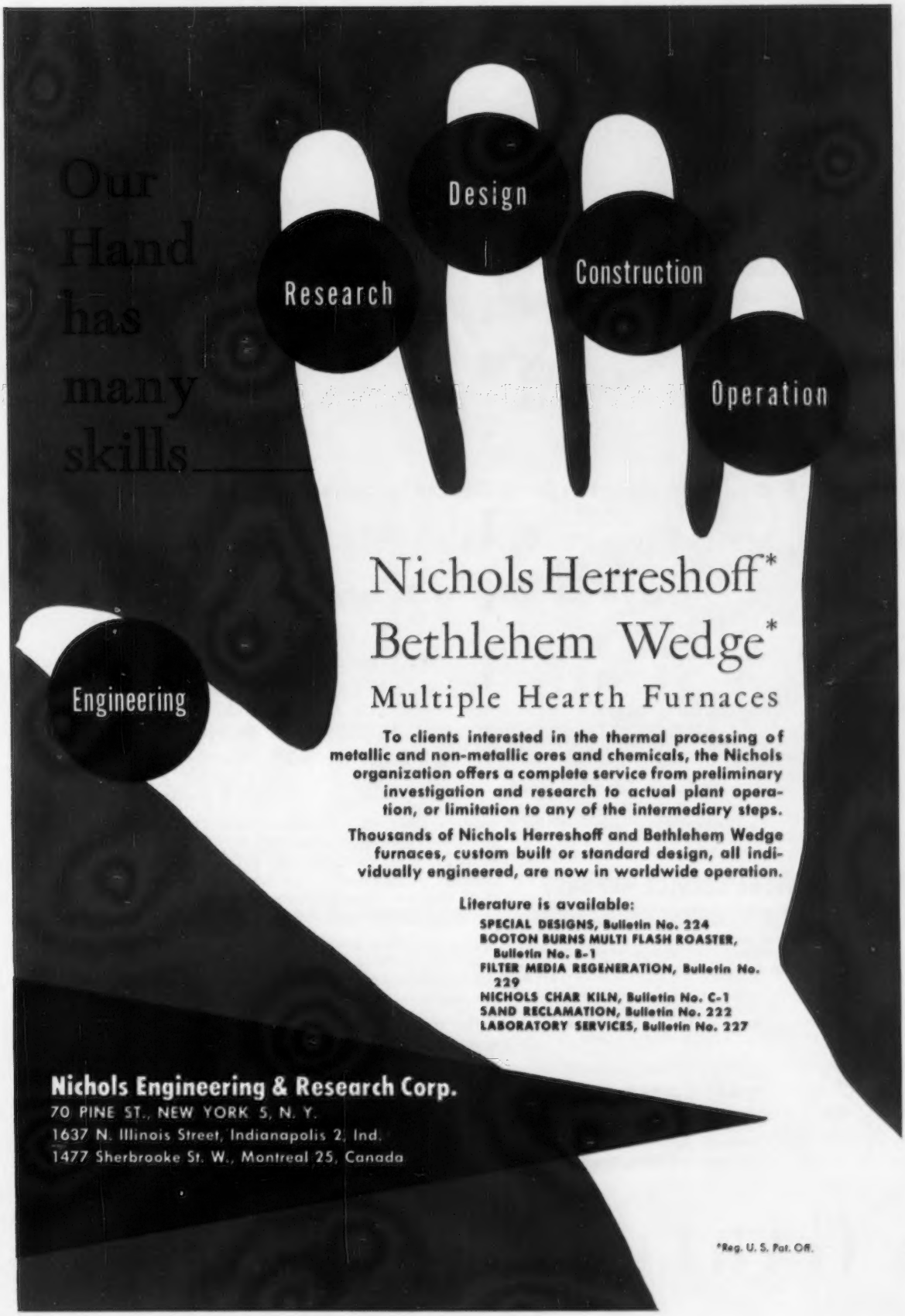
☐ **Call your local** Civil Defense Director. He'll help you set up a plan for your offices and plant—a plan that's safer, because it's integrated with community Civil Defense action.

☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here, again, your CD Director can help. He'll advise you on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First-Aid Training Courses. They may save your life.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good community relations—and no greater way of helping America.

Act now . . . check off these four simple points . . . lives are at stake . . . have you a right to delay?



Nichols Herreshoff* Bethlehem Wedge*

Multiple Hearth Furnaces

To clients interested in the thermal processing of metallic and non-metallic ores and chemicals, the Nichols organization offers a complete service from preliminary investigation and research to actual plant operation, or limitation to any of the intermediary steps.

Thousands of Nichols Herreshoff and Bethlehem Wedge furnaces, custom built or standard design, all individually engineered, are now in worldwide operation.

Literature is available:

SPECIAL DESIGNS, Bulletin No. 224
BOOTON BURNS MULTI FLASH ROASTER, Bulletin No. B-1
FILTER MEDIA REGENERATION, Bulletin No. 229
NICHOLS CHAR KILN, Bulletin No. C-1
SAND RECLAMATION, Bulletin No. 222
LABORATORY SERVICES, Bulletin No. 227

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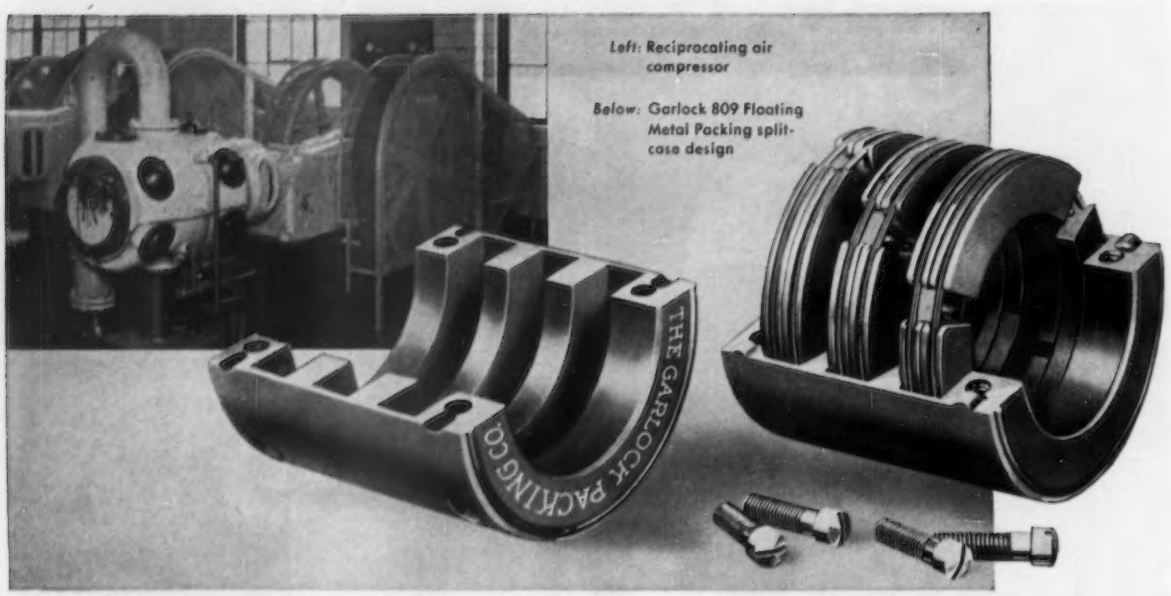
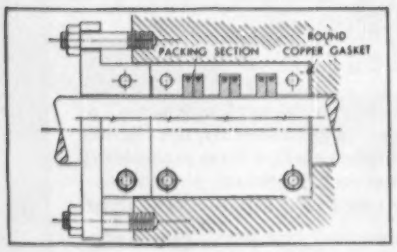


Left: Reciprocating air compressor

Below: Garlock 809 Floating Metal Packing split-case design

For air compressors, users report GARLOCK SPLIT-CASE METAL PACKINGS have 2 big advantages



TYPICAL SERVICE REPORTS

- On an electric-driven compressor, rod size 1¾", 277 r.p.m., operating continuously, Garlock metal packing has been in service 9 years with the original cast iron rings and only .002" rod wear.
- On steam-driven, variable-speed compressors in a power plant, Garlock split-case metal packings have operated satisfactorily for 15 years without replacement of any parts.

1. **LONG, TROUBLE-FREE LIFE.** Minimum of 7 years with proper lubrication.
2. **CAN BE INSTALLED *WITHOUT* DISCONNECTING THE ROD.** Downtime is reduced to a minimum.

You can eliminate the cost of frequent packing replacements and unnecessary downtime by installing Garlock split-case metal packings on your reciprocating air compressors. Service reports like those at the left, show that these Garlock metal packings have given 15 years *and more* of trouble-free service with a minimum of rod wear.

The minimum packing space for Garlock 809 split-case metal packing is ½". Garlock 805 (also split-case) can be used in smaller packing spaces since it is installed outside the stuffing box.

For complete information, call your Garlock representative or write today for Brochure 3889.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, Los Angeles, New Orleans, New York City, Palmyra (N. Y.), Philadelphia, Pittsburgh, Portland (Ore.), Salt Lake City, San Francisco, St. Louis, Seattle, Spokane, Tulsa.

In Canada: The Garlock Packing Company of Canada, Ltd., Toronto, Ont.

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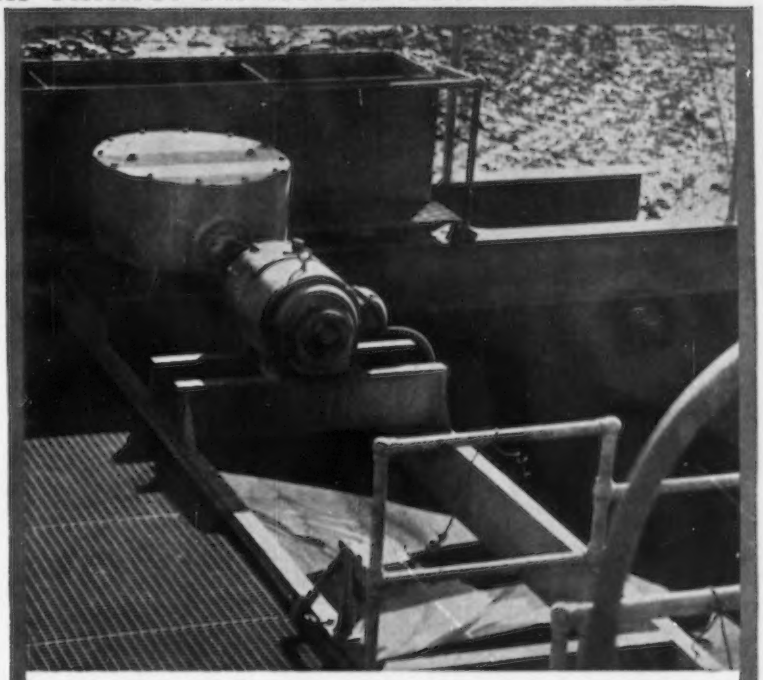

One of the two Turbo-Mixers installed in 1941 at Universal Atlas Cement Company at Northampton, Pennsylvania, in cement slurry suspension.

Today, after *100,000 hours* of heavy-duty, *24-hour service*, these Turbos continue to operate with no more than normal plant maintenance. They are typical of the thousands of Turbos operating in continuous-flow processes where "down-time" is critical—where low maintenance is essential.

Turbos can help solve your agitation problems, whether your business is petroleum processing, chemicals, pharmaceuticals or minerals beneficiation. Turbo's built-in ruggedness that permits continuous 24-hour heavy-duty service assures you of "headache-free" production and lower costs in the long run.

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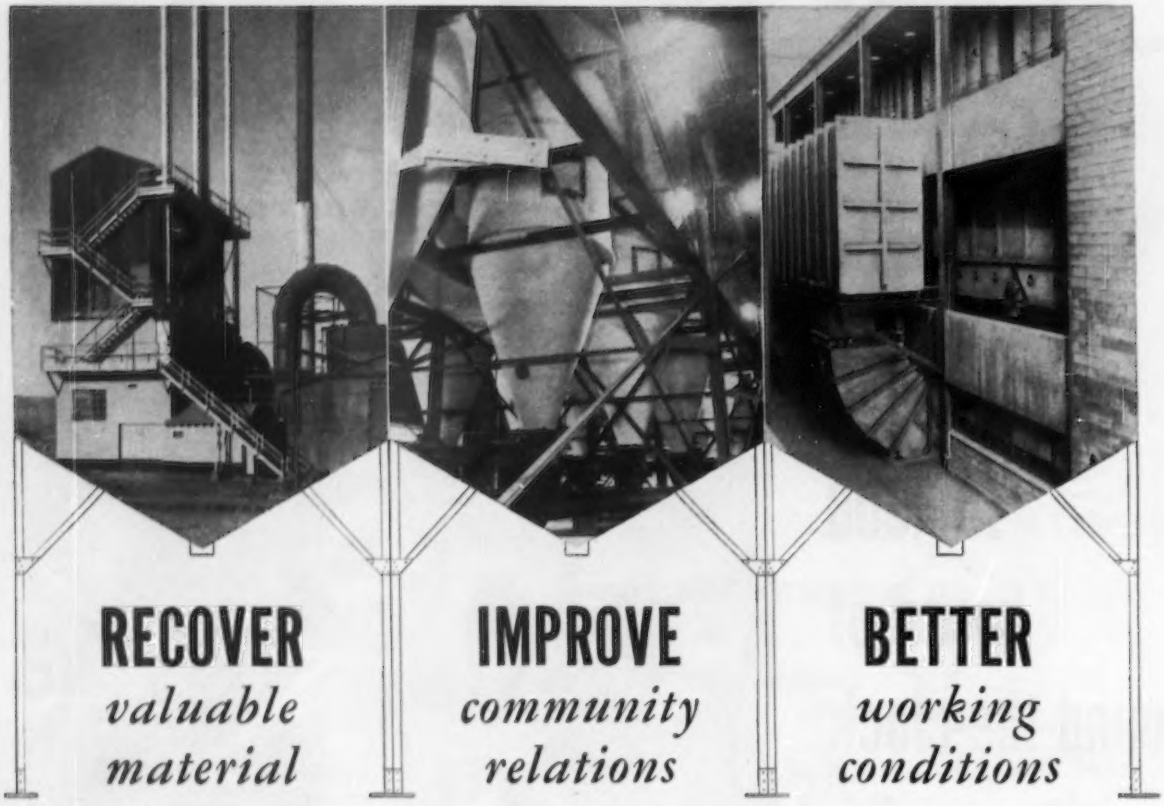

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IMPROVE *community relations*

BETTER *working conditions*

Turn problems into profit by installing Wheelabrator Dustube collectors to salvage ALL the dust created in your operation. Let their simple cloth tube design help you recover valuable material and eliminate the nuisance and hazard of dust-filled air that gives rise to employee and community relations problems.

Dustube collects material in the dry state so it can be reused without thickening, filtering or drying. Screw conveyors or other automatic handling devices save hours of manual handling in taking the material to a common point for processing.

Dustube collectors are particularly suited, through the use of synthetic filtration fabrics, to the recovery of values in gases from sintering machines, blast furnaces, refining furnaces and similar processes. Gas at initial temperatures as high as 2000° can be easily cooled and filtered at temperatures well above the dewpoint. Combustible gases and dust are also safely controlled.

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For more information on Dustube principles, construction and performance, write today for your copy of catalog No. 372.

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First, PIONEER Continuflo Conveyors are jig-built at the factory, with joint frames between the sections to keep them straight and true.

Second, Head and tail pulleys are of large diameter to prevent belt slippage.

Third, Flexible rubber impact idlers absorb shock of falling materials, thus reducing cutting and wear of belt.

Fourth, Specially-designed self-aligning troughing idlers, in addition to forward tilt of regular idlers, hold belt in line.

Fifth, New-type self-cleaning rubber return idlers virtually eliminate build-up of abrasive materials on roller.

Sixth, Rollers and idlers turn easily. Anti-friction bearings are used throughout. This also cuts power requirement.

Needs fewer support towers

Another outstanding feature of PIONEER Conveyors is their extra strength and rigidity. Angle iron construction, welded vertical and diagonal braces, and upper and lower chords tied together with lattice-frame construction make it possible to space support points as far apart as 40 feet.

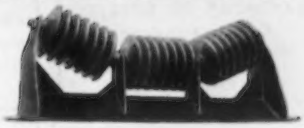
It's easy to assemble PIONEER conveyors because no section is over 10′ in length. Head and tail sections are specially built to meet your H.P. requirements.

TONS PER HOUR DELIVERED BY PIONEER CONVEYORS*

Belt Width	Belt speed in feet per minute			Maximum lump size	
	300′	400′	500′	Sized	Unsized
18″	156	—	—	4″	6″
24″	276	368	—	6″	8″
30″	432	576	720	7″	12″
36″	624	832	1040	8″	16″

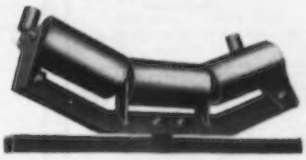
*Based on material weighing 2700 lbs. per cubic yard.

PIONEER Mesabi-type impact idler



PIONEER Rubber roll self-cleaning return idler.

PIONEER Self-aligning troughing idler



Ask your conveyor salesman these questions

1. What type of bearings are used?
2. Are they located on through shafts?
3. How many support towers will be necessary?
4. What's the approximate cost of assembling and erecting?

For helpful 52 page book telling how to select the right conveyor for YOUR job, write Pioneer Engineering Works, Inc., Minneapolis 13, Minn. (subsidiary of Poor & Company, Chicago) or nearest PIONEER Distributor.

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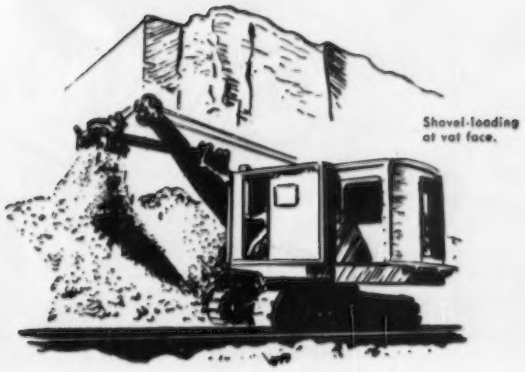

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Analyze
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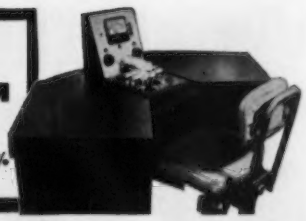

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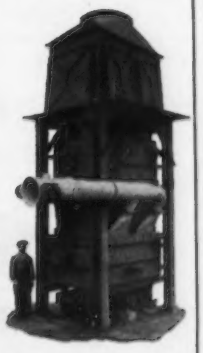

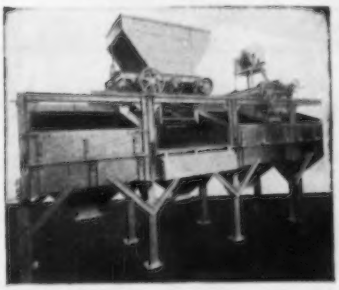

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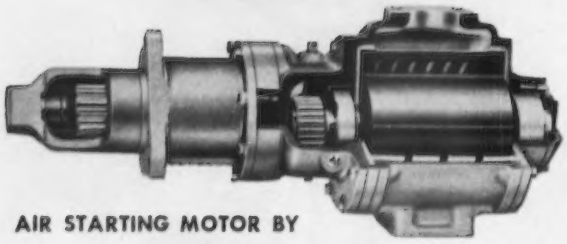

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Now you can banish starting problems so often encountered under adverse weather conditions with gasoline and diesel engines—eliminate the need for heavy-duty batteries, oversized generators, switches and cables. With new Startaire you get, instead, the dependability and economy of powerful compressed air engine cranking—*immune to cold and heat*—that assures you of fast-action, trouble-free starting. Startaire air starting motors, of rotary multi-vane design, are equipped with a friction clutch and housing and come to you in ready-to-install units which are easily interchangeable with electrical starting motors. See your Authorized Bendix-Westinghouse Distributor.

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- Assures Quicker Starts
- Reduces Electrical Maintenance
- Eliminates Need for Extra Batteries, Large Generators
- Reduces Total Vehicle Weight
- Requires Less Space
- Assures Safe, Explosion-Proof Cranking
- Is Immune to Cold and Heat

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For Tamping Explosive Shots: Poles are round, made of Hardwood. Sizes to 10' long. Price per lineal ft.: 1" dia. 8c; 1⅛" dia. 12c; 1¼" dia. 14c; 1⅜" dia. 16c; 1½" dia. 18c; 1⅝" dia. 28c; 2" dia. 32c. Special diameters and lengths can be furnished. These Poles meet the requirements of the New Federal Mine Safety Code.

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Couplers and Head Blocks are 4, 5 and 6 inches in diameter. Please specify size when ordering. Poles are 1½" in diameter.

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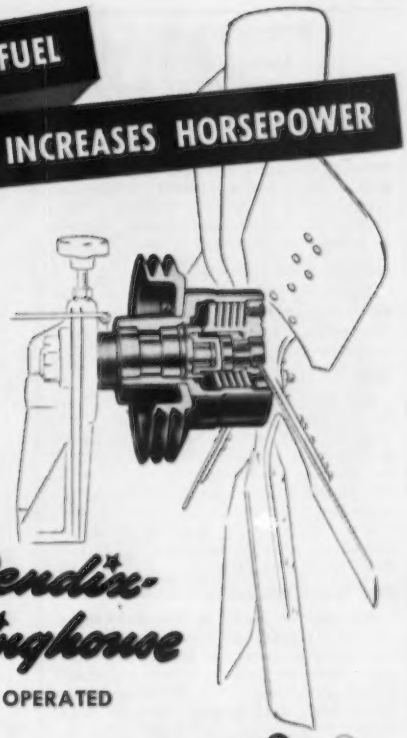

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- Fuel Savings
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- Saving in Engine Wear and Maintenance
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Age limit about 45. Must be graduate metallurgist having operating experience and with aptitude and experience in laboratory research and process development. Heavy sulphide ore experience desirable. Qualified to succeed to superintendency.

ASSISTANT MINE SUPERINTENDENT

Age 30-42. Must be tactful and adaptable. Require man with excellent mining engineering training. Some operating experience necessary.

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Age limit 45 preferably about 35. Must be graduate mechanical, chemical or civil engineer with natural mechanical ability, excellent practical and supervisory and some construction experience, for charge under Chief Engineer of all shops, foundry, mobile equipment including loading, marine, railway and construction; maintenance and repair of all types of equipment; 7250 KVA diesel generating plant.

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Age limit 48. Should be competent supervisor with practical ability required to operate local mine shops and surface equipment and to routinely maintain surface and underground equipment. Local facilities backed up by heavy duty general shops for major repairs.

Forward with initial reply complete educational and experience records, list of references, age, marital status, number and age of children, photo (optional). Company offers three year contract, furnished house, transportation self and family, liberal vacations. Excellent climate, living conditions, medical and hospital facilities. School to 14 years. Non-contributory pension plan. Salary open.

P-6781 Eng. & Mining Journal
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Research Metallurgists and Chemists for employment in Northern Rhodesia on research and development work in the field of non-ferrous extractive metallurgy, with particular reference to copper, cobalt, lead and zinc.

In addition to the basic salaries quoted below, all the positions advertised carry a variable cost of living allowance (at present £7.16.0. Sterling (per month) and variable copper bonus (at present approximately 73% of basic salary) as well as generous pension, life assurance and medical schemes.

Replies stating age, marital status, qualifications and specific details of experience should be addressed by airmail to:—

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4. **Analytical Chemists,** must be graduates in chemistry or qualified assayers, with minimum 3 years practical analytical experience. Starting salary £890 (Sterling) per annum.

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Position available in Mineral Dressing Sales Department of large, national chemical manufacturer for graduate mining or chemical engineer or chemist. Work involves sales analysis and forecasting, inventory control, market research, and customer contact. Age to 30. New York City location.

Please submit complete resume including age, education, experience and salary desired.

P 7370 Engineering & Mining Journal
330 W. 42 St., New York 36, N. Y.

PROJECT ENGINEER WANTED

Graduate Mechanical, Metallurgical or Chemical Engineer wanted by medium size progressive heavy machinery manufacturing company, in S. E. Pa. He is to assist in design and preparing for market, various lines of equipment used in mineral dressing, heavy chemical, cement and rock product industries. Must have had good engineering and field experience and be willing to travel and do field service. This is a permanent position of increasing importance within organization.

P 7533 Engineering & Mining Journal
330 W. 42 St., New York 36, N. Y.

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CHEMICAL RESEARCH ASSISTANT: B.S. or A.B. in chemistry or chemical engineering. This assignment will emphasize application of new techniques for extraction as well as experimentation on liquid-liquid extraction of metals from ores. Send resume of education, experience and salary expectations to M. L. Baas, Metals Research Laboratories of the Electro Metallurgical Company, P. O. Box 580, Niagara Falls, New York.

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Young, recent graduate, with one or two years' experience in underground engineering. Duties will be varied, including surface and underground survey, calculation, mapping, drafting and other miscellaneous work for underground metal mine. Location Southeast.

P7393 Engineering & Mining Journal
330 W. 42 St., New York 36, N. Y.

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POSITIONS VACANT

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Geophysicist graduate, experienced in interpretation and field magnetometer, electromagnetic, resistivity, scintillation surveys to head Geophysical Department of expanding exploration company starting at $400 per month. Room 607—320 Bay Street, Toronto, Canada. EM-4-7051.

Wanted: Heat-Power Mechanical Engineer with at least five years experience. Large copper company. Choice location western U. S. Salary dependent upon ability. Send full personal resume and references with first application. P 7356, Engineering & Mining Journal.

POSITIONS WANTED

Met. Engr., Grad. Colo. Sch. of Mines. 25, family. 2 yrs. industrial experience. Analyzing data and writing reports my specialty. Ability to talk with people on all levels. Desire position with progressive organization with opportunity to prove ability.. PW 7502, Engineering & Mining Jrl.

Mining Engineer, 32, family, 10 yrs experience in selective and mechanized underground metal mining, exploration, building construction, earthwork, mining design and control, planning, production and safety; seeks position in staff or line capacity. West preferred. Available 30 days. PW 7512, Engineering & Mining Journal.

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Iranian Engineer B.S. & M.S.C.E. Purdue, Ph.D. Cornell, 25, aggressive, selling experience, seeks to represent American firms in Iran. PW 7437, Engineering & Mining Journal.

Mining Engineer, 37, B.S. Married, no children. 14 years varied experience in exploration, designing, production, and administration. Underground and placer mines. U.S. and South America. Speaks Spanish and Portuguese. Desires responsible position with foreign or domestic mining company engaged in production, exploration, or consulting work. Employed, available 30 days. PW 7419, Engineering & Mining Journal.

Metallurgical Engineer, 28, B.S., Married, with operation experience in large South American concentrator desires responsible position in West or Abroad. Spanish spoken. PW 7423, Engineering & Mining Journal.

Senior Accountant & Internal Auditor. Five years public accounting practice, work simplification & systems and procedures training. U. S. college background and 18 years experience in mining-metallurgical problems in Mexico and abroad. Ready for controllership or any other challenging assignment of top level function. Unostentatious leader and a good follower presently engaged with prominent industrial firm in Mexico in supervisory capacity. Would travel & organize accounting and financial structure and reporting to safeguard assets. Will welcome offers. Age, 42; Married; English-Spanish. PW-7352 Engineering & Mining Journal.

Economic Geologist/Petrographer, Ph.D. well prepared in igneous, sedimentary, and metamorphic geology; familiar with occurrence of ores of the base, rare, and radioactive elements; skilled in opaque microscopy and microchemistry as applied to the study of ores; versatile, linguistically equipped for library research, widely travelled, seeks suitable position in industry for exploration, research, writing, or part-time consulting. Would also consider teaching in good institution. Member of various scientific societies and with good references. Available on reasonable notice. PW 7315, Engineering & Mining Journal.

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1—500 cfm GD Diesel Skid Mtd. w/D13000 Cat Engine—Like New.
1—420 cfm, same as above.
1—2695 cfm I.R. Model PRE-2 w/435 H.P. Synch Motor.

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(Write for bargain prices & complete list of sizes.)

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5—Dorr DSFH 4' x 21'8" Duplex.
1—Dorr DSFH 6' x 26'8" Duplex.
1—Denver 8' x 26' Duplex.
4—Dorr DSD 6' x 23'6".
1—Denver 15" x 13' Simplex.

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1—Akins 24" x 10' Double Pitch.
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1—300 KW 480V, 3ph, 60 cycle with GM 8-268A Engine.
1—250 KW 480V—W/GM 8-268A Engine.
2—112½ KVA 220/440V D17000 Cat Engines Radiator Cooled.
1—75 KW GE 480V W/D13000 Cat Engine.
4—50 KW 220V 3 ph., 60 cycle with International UD18 Engine.

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2—Denver 6 cell #15 Rubber Parts.
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5—Fagergren #9-S Rubber Parts.
1—Denver 6 cell #24 Rubber Parts.
1—Denver 4 cell #24 Rubber Parts.
1—Denver 2 cell #24 Rubber Parts.
1—Denver 2 cell #18 Rubber Parts.
1—Denver 3 cell #18 Rubber Parts.

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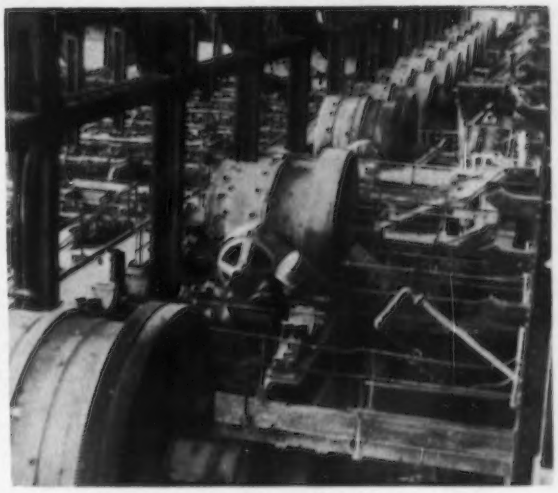
1—4' 1-leaf Eimco.
1—3' x 4' Oliver Drum.
1—6' 2-leaf Eimco.
1—4' 2-leaf Eimco.

JIGS

1—16" x 24" Denver Duplex.
1—12" x 18" Denver Duplex.
1—12" x 12" Pan American Duplex.



86 MARCY BALL MILLS

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6—Mancha Titan A Battery 18" ga.
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24—Marcy 86 Ball (8' x 6')
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Inset shows roll of SCANDURA. Photo at left shows Face Conveyor in coal mine.

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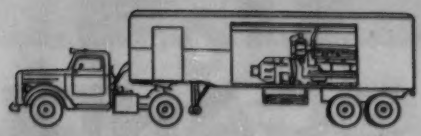

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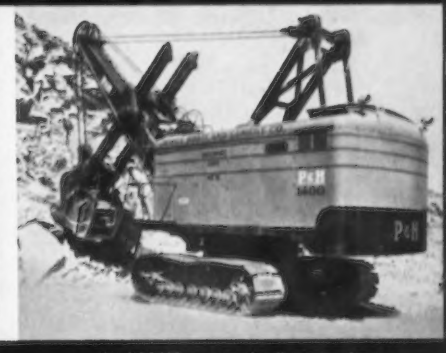

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